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# THE FESTIVUS

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Annual dues are payable to San Diego Shell Club.  
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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### Hard Bottom Habitats off San Diego and the Design of Marine Preserves

Ed Parnell a post-doctoral researcher at Scripps  
Institution of Oceanography will give a powerpoint

presentation on designing marine reserves off San Diego  
and discuss current preserves.

Meeting date: January 20, 2005

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## CLUB NEWS

### Minutes of the San Diego Shell Club meeting November 18, 2004

The start of the meeting was delayed because of the great interest in the extensive book and reprint sale. President John LaGrange officially called the meeting to order at 8:00 p.m. The minutes of the October meeting were approved as published in *The Festivus*. Carole Hertz gave a brief presentation regarding membership dues for 2005 and the Club's Christmas Party at the Butcher Shop Restaurant on Saturday, 4 December. Mike Miller will be giving a presentation as part of the evening's events.

Wes Farmer mentioned that there is a tremendous number of *Donax gouldii* popping on the sandy beaches from Del Mar to Oceanside. He described a brief experiment that he ran in which his calculations showed that there are millions of these small bivalves this year.

John LaGrange introduced the speaker for the evening, Roger Clark. Roger is an Invertebrate Biologist with the National Marine Fisheries and he goes out each summer to study the health of the Alaskan fisheries. His presentation was mostly on trawled and intertidal material from the Aleutian Islands. He started his PowerPoint presentation with pictures of the boats that he has worked on and followed this with some photos of the larger species that they sometimes collect, such as: wolf eels, salmon sharks, large halibut, huge king crabs, and giant octopuses. Roger spent most of the evening showing photos of the mollusks from the Aleutians, many of which can be seen on the Jacksonville Shell Club website. These included many species of chitons, buccinids, bivalves, trochids, trophons, and turrids. He showed a photo of the largest species found there, a 165 mm specimen of *Pyrulofusus dexius*. Many of the shells he pictured are rare, beautiful and only found in deep water.

The meeting was adjourned at 9:15 pm so that the attendees could sample the refreshments and continue to study the available sale books and reprints. Cookies were provided by Silvana Vollero and Kent Trego.

Jules Hertz

### SCUM 2005

The ninth annual meeting of the Southern California Unified Malacologists will be held at the City of San Diego's new Environmental Monitoring and Technical Services Laboratory building at 2392 Kincaid Road. Doors will open at 8 AM for donuts and coffee with the meeting beginning about 9 AM. For more information and RSVP

contact: Ron Velarde 619-758-2331  
Rvelarde@sandiego.gov or Kelvin Barwick 619-758-2337: Kbarwick@sandiego.gov

### The Annual Christmas Dinner Party Saturday, December 4<sup>th</sup>

Everyone had a great time! The over thirty people attending the party enjoyed being a part of another holiday together. The Board Room at The Butcher Shop was beautifully decorated for the holidays with a lovely tall tree in the far corner. The tables were adorned with centerpieces of *Strombus gigas* (generously donated by Don and Jeanne Pisor) and planted with poinsettias. (These were raffled off later in the evening.)

After a fun hour of visiting with friends, some of whom are seen too rarely and one new member, Gerard Venken, who came all the way from Belgium, the delicious dinner was served. Many people remarked on the fine quality of the food and service.

During the break between the entree and the fabulous dessert of white-chocolate raspberry cheesecake, MC Carole Hertz installed the new board for 2005 – this after the election of officers for 2005 held tardily at the start of the evening since it had been forgotten at the November meeting. Outgoing president John LaGrange thanked his board for making the year 2004 a success and Carole Hertz gave the Club's appreciation to retiring Dave Mulliner for his many years of service as *The Festivus* staff photographer, one who made house calls in the early years beginning in 1972 and was responsible for most of the fine photography in *The Festivus* through these many years.

Mike Miller was the evening's speaker. He gave a most enjoyable presentation on nudibranchs, giving much information on the life styles, feeding, habitats etc. of these beautiful creatures. This was followed by the annual gift exchange. A funny thing happened when several people chose gifts and the boxes were empty. It seems the restaurant placed wrapped boxes under the tree for ornamentation – and some people unwittingly chose them!

People lingered awhile after the evening's program, not really wanting the evening to end. It was fun.

### Dues are Due

Dues for the year 2005 are due now. This will be the last issue for those who have not paid their dues.



## A PRELIMINARY SURVEY OF THE MARINE MOLLUSKS OF THE ISLAND OF MUSTIQUE, WEST INDIES

SUSAN J. HEWITT

American Museum of Natural History

Send correspondence to: 435 E 77th St. Apt 3G, New York, NY 10021, USA

E-mail: hewsub@earthlink.net

### Introduction

Mustique is a small island situated 140 miles west of Barbados at latitude 12.53° N and longitude 61.10° W. It is one of the Grenadine Islands and is part of the country of St. Vincent and the Grenadines, which in turn is part of the southern half of the Windward Island chain of the Lesser Antilles (Figure 1). I visited Mustique five times, in April/May of 1991, '92, '93, '94, and '96, staying at the Cotton House hotel for eight or nine days each time. I hand-picked dead shells from sparse beach drift and from snorkeling, and also observed and noted whatever living marine mollusks I came across, but I did not collect any live material.

Despite many centuries of interest in Caribbean shells and much collecting by amateurs, there are surprisingly few faunal lists for the islands of the West Indies. The Antilles include approximately fifty islands that have airports or airstrips, many other smaller inhabited islands, and countless named but uninhabited islands, for a total of perhaps 1,000 islands comprising about 30 countries. The better known lists are for Cuba (Aguayo & Jaime, 1937–1948), Grand Cayman Island (Abbott, 1958), Jamaica (Humphrey, 1975), Puerto Rico (Warmke & Abbott, 1961), Virgin Islands: St. Croix (Usticke, 1959, 1969 & 1971), Curacao, Aruba and Bonaire (De Jong & Coomans, 1988, gastropods only). Such lists as currently exist are sufficient to establish the presence of many species in the West Indies as a whole, but without searching through museum collections to extract locality data, it is hard to construct biogeographical distribution maps for individual species, especially for the common, so-called ubiquitous species, some of which are present or absent in neighboring islands in unpredictable ways (Redfern, 2001, p. viii). Even museum collections cannot always provide a suitable volume of necessary data, as smaller

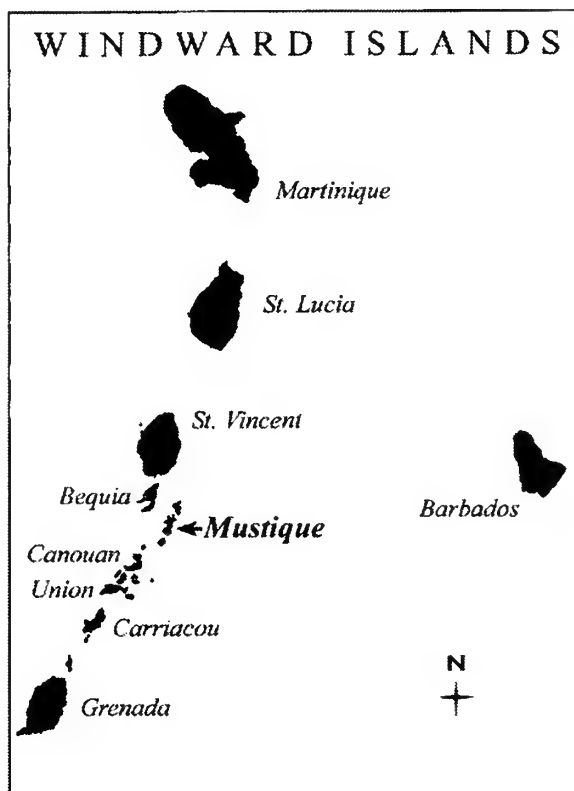


Figure 1. Map of southern Windward Islands and Barbados.

and more common species are very often overlooked by all but the most scientific collectors.

The Grenadines are a string of attractive small islands, some inhabited and some not, which lie between the two larger islands of St. Vincent to the north and Grenada to the south. Most of the Grenadine Islands belong to the country of St. Vincent and the Grenadines, but the most southerly few, including Carriacou, belong to the country of Grenada. The Grenadine island chain

has long been popular with the yachting set. The west coasts of the islands are bathed by the calmer Caribbean Sea, while the east coasts are exposed to the rougher waters of the Atlantic Ocean.

Mustique (Figure 2) is privately owned, and is managed by the Mustique Company. The island is only 2.5 by 5 km, but being volcanic in origin the terrain is, relatively speaking, quite rocky and hilly, and the roads are narrow and winding. The highest point is Adelphi Hill in the south at 149 meters. Although the summer months can have some heavy rain and occasional storms, Mustique is too far south to be in the path of almost all hurricanes, and the climate overall is on the dry side and supports mostly thin scrub forest, with cactus in the driest spots.

There is one hotel, The Cotton House, near the northwest tip of the island, and one guesthouse, Firefly, on Britannia Bay. The Cotton House "great house", the old mill and some of its cottages are stone (greenish-gray volcanic rock and white coral rock) and date from the 18<sup>th</sup> Century. These buildings were part of the original sugar plantation when Mustique was under British colonial rule. The French owned the island before that, naming it "Moustique," meaning mosquito. This subsequently became anglicized as Mustique, which is pronounced as if to rhyme with "plus teak."

The innumerable mosquitoes were brought under control not long after Colin Tennant (Lord Glenconner) bought the island in an almost completely undeveloped form in 1958. As well as creating roads and other basic services, he also pioneered the cultivation on Mustique of the indigenous West Indian perennial cotton plant known as Sea Island cotton or tree cotton (*Gossypium barbadense* Linnaeus) for a number of years, and this is how the Cotton House hotel got its name.

There is almost no night life on the island except for a very picturesque and apparently world-famous beach bar and restaurant called Basil's Bar, run by Basil Charles, who also created the general store, and who functions as a sort of unofficial mayor of Mustique. The island has less than a hundred private homes which are, in the main, large and elegant. Many of these homes can be rented out by the week or the month from the Mustique Company during the times their owners are not in residence. Since the 1960s this island has served as a sort of peaceful and picturesque island retreat for the rich and/or famous. The island seems naturally and spontaneously calm, safe, beautiful and unspoiled, but in reality it is very carefully maintained and regulated to stay that way.

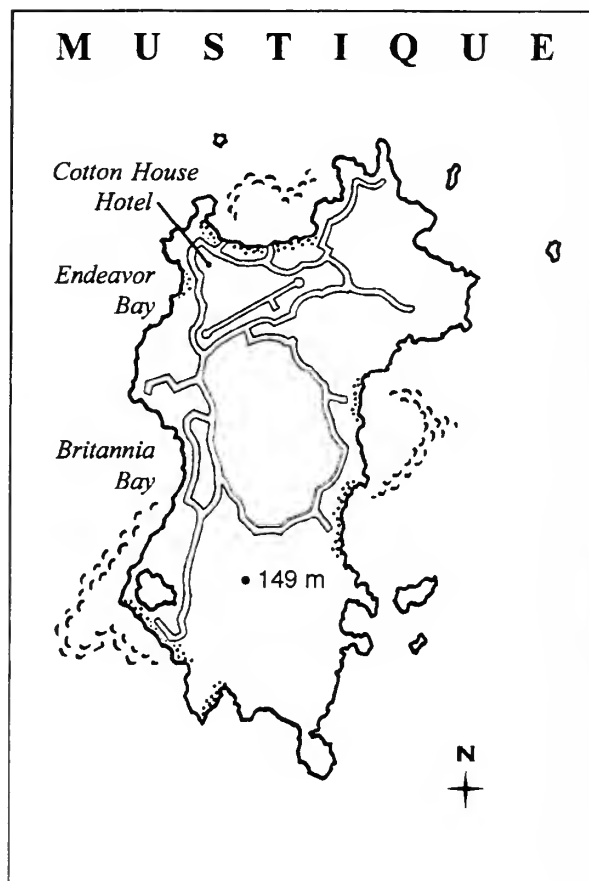


Figure 2. Map of Mustique, drawn by Pat Redding Scanlon from a satellite photo.

Because Mustique is quite underdeveloped and protected, much of the original fauna and flora remain intact. Although there are visiting fishermen who are allowed to work out of Britannia Bay on an overnight basis, and who sell the local catch, including *Strombus gigas* Linnaeus, 1758, to those who live on Mustique, nonetheless the intertidal and shallow subtidal zones appear to be mostly in good condition. However, the marine mollusk fauna of Mustique, and indeed of the rest of the country of St Vincent and the Grenadines, appears never to have been surveyed in any detail. When Warmke and Abbott (1961, chapter 1) reviewed shelling destinations in the Caribbean, there was no mention of St. Vincent and the Grenadines. And since then, only a little research appears to have been done. Rosenberg (Malacolog 3.3.2, July 2004) shows 103 records of marine gastropod species from St. Vincent, 15 from "the Grenadines", 10 from Bequia (Figure 1),

and only 3 from Mustique, as follows: *Stephopoma myrakeenae* Olsson & McGinty, 1958, *Conus cedonulli dominicanus* Hwass, 1792, and *Conus nodiferus* Kiener, 1845.

### Results

Table 1 shows a total of 31 species, the great majority of which were from Endeavor Bay (Figures 2, 3). One species is a historical record only; in an earth bank beside the hotel driveway leading up to the entrances of the two highest cottages on the hill, northwest of the hotel "great house", I noticed some shards of ceramic and glass embedded in the soil. The driveway cuts through a kitchen midden (the remains of an old kitchen rubbish heap). Judging by some fragments of what is probably imported English china, the midden appears to date from circa 1850. Mixed in with the pieces of ceramic and glass there was a shell of *Cittarium pica* (Linnaeus, 1767), and also one of *Voluta musica* Linnaeus, 1758. The *Cittarium pica* shell, although full of earth, still looked quite fresh, but the volute was considerably faded and whitened, and had lost almost all of its luster. *Cittarium pica* is a well-known and well-loved food species in the Caribbean, and thus had almost certainly been eaten, but it is interesting to speculate whether the Music Volute had also been collected live and pressed into service as part of an elegant plantation dinner, or whether it had simply been a beach drift shell that had been picked up as a curio and then thrown out with the kitchen trash.

### Discussion

Rosenberg's Malacolog is an on-line database of the western Atlantic gastropod species. It is an extremely valuable and easily accessible compilation of information, including biogeographical data. As time goes by we will see other wide-reaching efforts to consolidate information for the western Atlantic bivalves and other classes of mollusks, including their ranges and distributions. And, therefore, whenever reliable data can be published from individual islands within the West Indies, this can be useful. Even modest lists such as the present one, can assist with the on-going efforts to consolidate our knowledge and understanding of patterns of species distribution within the Caribbean faunal province.

Out of the 31 species seen on Mustique, most are considered common. Six live species were observed, including reef squid. A live-collected shell of *Strombus*



Figure 3. View of Endeavor Bay, Mustique, looking north, 1993.

*gallus* Linnaeus, 1758, was shown to us by fishermen who work out of Britannia Bay (Figure 2). The remaining 25 species were identified from very beachworn shells.

As conservation pressures world-wide cause routine live collecting to become less and less acceptable, it is now particularly helpful to learn to identify shells in their beachworn state. This way a fauna can be studied without any harm to the ecosystem. And as a result of these same considerations, beachworn material is now considered useful in museum collections in a way that was often not the case 50 years ago.

Four different species from the beach drift of Mustique are illustrated here. One is a small (18.2 mm) beach-worn cone that has a white background interrupted with orange flammules. This is possibly *Conus flavescens* Sowerby, 1834 (Figure 4).

Although the other shells illustrated are also very worn, it is possible to put confident identifications on them. The second gastropod species shown here is a worm snail which has not often been well-illustrated in the popular literature: *Dendropoma corrodens* (d'Orbigny, 1842) (Figure 5). This species very often lives on other shells, and here it had been living on live *Fissurella barbadensis* (Gmelin, 1791) which is apparently a very common habitat for the species (Rüdiger Bieler, personal communication, 2003). Each of these individual worm snails lives in a depression of its own making, and the depressions so formed on *F. barbadensis* (a relatively thick-shelled keyhole limpet) are often so deep that only a very thin layer of the host shell remains intact, such that on viewing the interior of the *Fissurella*, the brown *Dendropoma* shell is clearly visible though the thin translucent layer of remaining shell material of the host.

The smaller shells of this *Dendropoma* species are





Figure 4. *Conus* cf. *flavescens*, 18.3 mm H, apertural view. AMNH 309966. Photo: D.K. Mulliner.

very often brown and the juveniles are smooth (Redfern 2001: 49, pl. 26) but shells of larger, older specimens can be almost white with a rugged exterior as shown here. Bieler notes (personal communication) "...there is a strong change in color between the young brown ones and the greyish-white adults in *D. corrodens*. It occurs in many vermetids but the change is particularly pronounced in this species. The 'entrenching' into the calcareous substratum (shells, limestone, coralline algae) is a feature of *Dendropoma* – sometimes they hardly bother to lay down a thick shell layer on the lower side of the whorl. They use their strong radulae to excavate – to my knowledge there is no evidence of chemical 'boring' as is so common in boring bivalves."

The two small bivalves shown here are: *Timoclea pygmaea* (Lamarck, 1818) (Figure 6) and *Cavolinga blanda* Dall & Simpson, 1901 (Figure 7), the latter not often illustrated in the popular literature. Despite their extremely beach-worn state, both species are very easily identified, the *T. pygmaea* by its subquadrate outline, cancellate sculpture, and the brown stain on the hinge



Figure 5. *Dendropoma corrodens*, 2.5-7.6 mm (on *Fissurella barbadensis*) AMNH 309946.

line, the *C. blanda* by exterior characteristics alone, i.e. its ovate outline and the sculpture of deep concentric sulci, which vary in number from one to three or more on an adult shell.

No shells of *Strombus gigas* were collected, but other than this, the dead-collected shells I found have been donated to the American Museum of Natural History, New York, as voucher material. The catalogue numbers are AMNH 309938 through AMNH 309966 inclusive, and there will also be another three numbers, not yet designated, for three additional lots to be donated. If I have the good fortune to visit Mustique again, I will attempt to add more species to this preliminary list.

At the time of my visits in the early 1990s, no local permits for collecting were required, however, any collector currently intending to visit the Grenadines should contact Mr. Raymond Ryan, the Chief Fisheries Officer, Ministry of Fisheries, Government of St Vincent and the Grenadines, Kingstown, St Vincent and the Grenadines, West Indies, phone 784.456.1178, either to learn about current restrictions on collecting, or to apply for permission to carry out research projects.

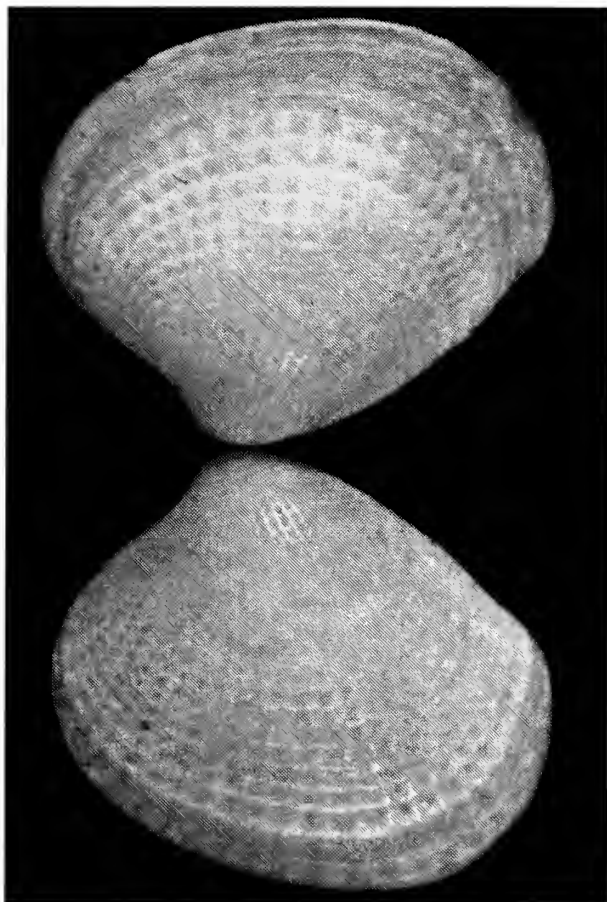


Figure 6a. *Timoclea pygmaea*, 2 valves (not a pair), 9.2 mm, exterior view, AMNH 309951.



Figure 6b. Interior view of same valves shown in Figure 6a . Photos: D.K. Mulliner.

### Acknowledgments

My thanks go to the Government Ministry of Agriculture of St. Vincent and the Grenadines for reviewing the research, and to Dr. Paula Mikkelsen, Curator of Mollusks in the Division of Invertebrate Zoology at the American Museum of Natural History, who assisted me with the identification and nomenclature of the bivalve species, and critically read drafts of the paper. Also thanks to Rüdiger Bieler, Curator, Department of Zoology (Invertebrates) of the Field Museum of Natural History, who confirmed the identity of the *Dendropoma corrodens* and discussed that species with me. Dave Mulliner took all but one of the shell photographs. Pat Redding Scanlon drew the maps, and Jean M. Hewitt advised me on the age of the pottery fragments. Information from Malacolog is provided with

the permission of The Academy of Natural Sciences, Philadelphia, PA.

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TABLE 1. MOLLUSK SPECIES FROM MUSTIQUE, WEST INDIES

SPECIES	LIVE/DEAD	LOCALITY	COMMENTS
<i>Notoacmaea antillarum</i> (Sowerby, 1831)	D	Endeavor Bay	Beach drift
<i>Fissurella barbadensis</i> (Gmelin, 1791)	D	"	"
<i>Fissurella angusta</i> (Gmelin, 1791)	D	"	"
<i>Astraea caelata</i> Gmelin, 1791	D	"	"
<i>Cittarium pica</i> (Linnaeus, 1767)	D	"	"
<i>Lithopoma tuber</i> (Linnaeus, 1767)	D	"	"
<i>Nerita tessellata</i> Gmelin, 1791	L	"	On rocks, mid tide
<i>Littorina ziczac</i> Gmelin, 1791	L	"	On rocks, high tide
<i>Cerithium litteratum</i> Born, 1778	D	"	Beach drift
<i>Dendropoma corrodens</i> (d'Orbigny, 1842) [on <i>F. barbadensis</i> shells]	D	"	"
<i>Hipponix antiquatus</i> (Linnaeus, 1767)	D	"	"
<i>Hipponix subrufus</i> (Lamarck, 1819)	D	"	"
<i>Strombus gallus</i> Linnaeus, 1758	L	Britannia Bay	Shown by fishermen
<i>Strombus gigas</i> Linnaeus, 1758	D	Endeavor Bay	Fished and dumped
<i>Cyphoma gibbosum</i> (Linnaeus, 1748)	L	"	Subtidal on gorgonian
<i>Columbella mercatoria</i> (Linnaeus, 1758)	D	"	Beach drift
<i>Rhombinella laevigata</i> (Linnaeus, 1758)	D	"	"
<i>Nassarius albus</i> (Say, 1826)	D	"	"
<i>Olivella nivea</i> (Gmelin, 1791)	D	"	"
<i>Voluta musica</i> Linnaeus, 1758	D	C. House hotel	From mid 19 <sup>th</sup> Century
<i>Hyalina avena</i> Kiener, 1834	D	Endeavor Bay	Beach drift
<i>Conus c.f. flavescens</i> Sowerby, 1834	D	"	"
<i>Bulla striata</i> Bruguière, 1792	D	"	"
<i>Chiton tuberculatus</i> Linnaeus, 1758	D	"	"
<i>Acanthopleura granulata</i> Gmelin, 1791	L	"	On rocks, mid tide
<i>Glycymeris pectinata</i> (Gmelin, 1791)	D	"	Beach drift
<i>Timoclea pygmaea</i> (Lamarck, 1818)	D	"	"
<i>Timoclea mazyckii</i> Dall, 1902	D	"	"
<i>Cavolinga blanda</i> Dall & Simpson, 1901	D	"	"
<i>Tellina fausta</i> Pulterney, 1799	D	"	Subtidal in bay
<i>Sepioteuthis sepiodea</i> (Blainville, 1823)	L	"	In the bay





Figure 7. *Cavolinga blanda*, 9 mm H, exterior view. AMNH 309943. Photo: D.K. Mulliner.

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## ADDENDUM TO MIENIS (2004)

[Editor's note. The ending of Henk Mienis' paper (*The Festivus* 36(11):144) was inadvertently omitted during the printing of the issue. We sincerely regret the error and place the last section of his paper below.]

I thank my colleague Robert G. Moolenbeek for his hospitality and constant support during my stay in Amsterdam.

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## LOW TIDES FOR 2005 AT SAN FELIPE, BAJA CALIFORNIA, MÉXICO

The entries below show periods of low tides of -3.90 feet and below. The times of low tides are given in Pacific Standard Time, except those dates marked with an asterisk are in Pacific Daylight Time. To correct for

Puerto Peñasco add one hour to listed times when they are in Pacific Standard Time. Tides below the midriff of the Gulf cannot be estimated using these entries. All entries are approximate times and tides.

Jan. 8	6:57 pm	-4.02 ft	Apr. 9*	9:33 am	-3.91 ft	Aug. 20*	9:39 am	-5.55 ft
Jan. 9	7:44 pm	-5.05 ft	Apr. 25*	9:30 am	-3.95 ft	Aug. 21*	10:18 am	-4.64 ft
Jan. 10	8:29 pm	-5.43 ft	May 23*	8:37 am	-4:06 ft	Sep. 16*	8:04 am	-4.51 ft
Jan. 11	9:13 pm	-5.06 ft	May 24*	9:15 am	-4.24 ft	Sep. 17*	8:42 am	-5.14 ft
Jan. 12	9:57 pm	-3.93 ft	Jun. 21*	8:25 am	-4.07 ft	Sep. 18*	9:19 am	-4.86 ft
Feb. 7	7:42 pm	-5.16 ft	Jun. 22*	9:10 am	-4.52 ft	Sep. 18*	9:40 pm	-4.09 ft.
Feb. 8	8:23 pm	-5.72 ft	Jun. 23*	9:56 am	-4.39 ft	Oct. 16*	8:40 pm	-4.44 ft
Feb. 9	9:02 pm	-5.40 ft	Jul. 20*	8:21 am	-4.28 ft	Oct. 17*	9:10 pm	-4.53 ft
Feb. 10	9:40 pm	-4.22 ft	Jul. 21*	9:07 am	-5.10 ft	Oct. 18*	9:39 pm	-3.99 ft
Mar. 8	7:31 pm	-4.80 ft	Jul. 22*	9:52 am	-5.20 ft	Nov. 14	7:15 pm	-4.02 ft
Mar. 9	8:08 pm	-5.17 ft	Jul. 23*	10:36 am	-4.50 ft	Nov. 15	7:46 pm	-4.01 ft
Mar. 10	8:44 pm	-4.68 ft	Aug. 18*	8:16 am	-4.65 ft	Dec. 1	7:54 pm	-4.04 ft
Apr. 8*	9:06 am	-3.94 ft	Aug. 19*	8:58 am	-5.55 ft	Dec. 2	8:32 pm	-3.93 ft

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### Deep Diving for Diversity: Highlights from Two Cruises in the East Pacific

Todd Haney, UCLA and LACM, and Cheryl Brantley, County Sanitation Districts of Los Angeles, will present a slide show on two recent research cruises aboard the R/V *Atlantis*, each led by Dr. Janet Voight of Chicago's Field Museum. The purpose of both cruises (1<sup>st</sup> to East Pacific Rise, 2<sup>nd</sup> to Gorda and Juan de Fuca Ridges) was to survey the diversity of invertebrates associated with hydrothermal

vents in the eastern Pacific. The slides will highlight the shipboard activities during the cruises, including the launch and recovery of the manned deep-sea submersible *Alvin* and some of the unique vent-associated animals that were collected. A DVD of actual dive footage from the second cruise will also be shown.

Meeting date: February 17, 2005

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting January 20, 2005

The meeting was called to order at 7:40 p.m. by President Jules Hertz. Two guests were present, introduced themselves, and were welcomed. The Minutes of the November meeting were voted to be accepted as published in *The Festivus*.

Vice-President John LaGrange announced that we can look forward, next month, to a report on a study by a submersible vessel on the Gorda Ridge and a program on white abalone in March.

Librarian Marilyn Goldammer had placed monthly journals on a side table and encouraged their being checked out like books. Used books at very inexpensive prices were being offered for sale on the back table.

Carole Hertz, Auction Chairman, announced that the annual Auction/Potluck of shells and shell-related articles will be held on Saturday, April 16<sup>th</sup> at Wes Farmer's condo complex. Attendees will gather at 5 p.m. to browse auction items, a potluck dinner will follow at 6 p.m., followed by the auction at 7 p.m. promptly. Donations are now being accepted.

Jules announced that Wes Farmer will continue as the Club's San Diego Botanical Society representative.

Larry Lovell introduced the evening's speaker, Dr. Ed Parnell, research scientist at Scripps Institution of Oceanography. A native San Diegan, he received his undergraduate degree at the University of California at San Diego, followed by graduate degrees from the University of Hawaii. He has spent the past thirty years observing and studying the local La Jolla Kelp Bed and Reserve. By recording habitat and species affinities, his work helps determine possible future preserves. Natural history and biological patterns were addressed and the giant kelp ecology was explained with the aid of an excellent PowerPoint program. Changes in the habitat have occurred with the warm water of "El Nino" years as well as with the cool water of the years of "La Nina." The San Diego (La Jolla) Ecological

Reserve was established in 1971. Surveys of green abalone, sheephead fish, and red urchins continue to be made and the reserve seems to be working for these species, yet many other species are declining. Poaching and lack of awareness of the reserve contribute to this. We learned that there were five different reserves in this area. A lively discussion on the future of fishing followed the program.

The door prize was won by Silvana Vollero. At 8:50 p.m. the meeting was adjourned for refreshments. Cookies were provided by the Goldammers, Schneiders, and Kent Trego.

Nancy Schneider

### The Club Web Page -- Up and Running Again

We have received several messages that the Club's web page is "down". The problem is now solved. To reach the Club web page, type <http://sandiegoshellclub.terryarnold.net/> in the window at the top of your web browser. Do not try to "search" for San Diego Shell Club. You will just get the old "broken" page. We strongly recommend that you bookmark it or add it to Favorites so that you can find it again.

### The Annual Auction/Potluck

The Club's annual Auction/Potluck will be held on Saturday, April 16<sup>th</sup>. Once again Wes Farmer will generously host this exciting event at the Community Room of his condo (map with directions will be included with the March issue). Festivities will begin at 5 p.m. with "Dave's Punch" and soft drinks giving attendees time to browse the auction table and silent auction. Dinner will be at 6 p.m. and the voice auction will start promptly at 7 p.m.

Please donate specimen shells, shell-related material and/or books to the auction, the proceeds of which support the Club's activities. If you cannot bring the material to a Club meeting, kindly contact a board member or auction chair Carole Hertz (858-277-6259) to arrange for pickup. More details later.

## *CORALLIOCHAMA ORCUTTI* WHITE, 1885 (PLAGIOPTYCHIDAE), A RUDIST BIVALVE

YVONNE ALBI<sup>1</sup>

7001 Vista del Mar Lane, Playa del Rey, California 90293  
holaster@aol.com

### Introduction

Rudists are curiously shaped Mesozoic bivalves that originated in Europe in the Late Jurassic and continued into the Late Cretaceous. They constitute the only major order of bivalves to have become extinct. The earliest rudists resembled heavy-shelled clams and, like oysters, attached one valve to the substrate. Of the many forms they took, an ice cream cone is the analogue for Plagioptychidae, the attached valve forming the cone and the free valve resembling a scoop of ice cream. The shape of *Coralliochama orcutti* White, 1885 (Figure 1), is typical of many plagioptychids. White (1885) described the species based on specimens from Punta Banda that were sent to him by Charles R. Orcutt, a San Diego geologist. Consequently White (1885) named the species after Orcutt. The geologic range of *Coralliochama* is reported to be from Early Cretaceous (Albian) (112-99 Mya) to Late Cretaceous (Maastrichtian) (71.3-65 Mya).

Rudists began with *Chama*-like shells attached to the substrate that evolved over the years and became progressively more inequivalve. Rudists rapidly radiated into different forms that are classified into eight or nine families. All rudist shells are non-nacrous; some having thick shells, some thin, and some having spongy shells. The shells of *Coralliochama* are considered to be spongy. Caprinidae is a large family of rather horn-shaped rudists in which *Coralliochama* was placed largely because of its shape. Skelton (1978) reassigned *Coralliochama* to the newly re-erected Plagioptychidae

Douvillé, 1888 (Figure 2) and separated Plagioptychidae from Caprinidae in part because plagioptychids have more characteristics found in Radiolitidae and not in Caprinidae. However, because

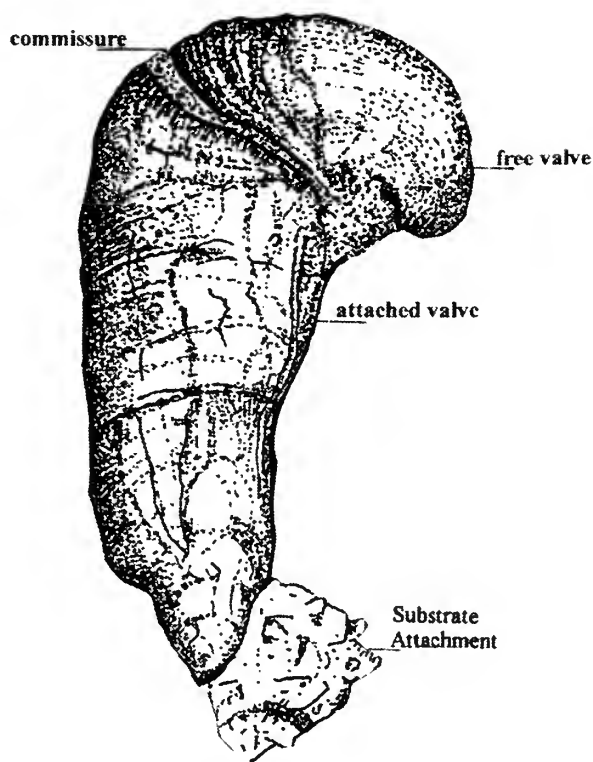


Figure 1. *Coralliochama orcutti* White, 1885, Cretaceous, late Campanian-early Maastrichtian Rosario Formation, Punta Banda, Baja California. Size: 140 mm.

the ligament in Plagioptychidae is only weakly invaginated, the ancestry of *Coralliochama* may instead lie in a weakly uncoiled inverse rudist of unknown origins (Skelton, 1978). Several rudist workers currently regard the family assignment as uncertain.

Endemic to the tropical western hemisphere,

<sup>1</sup> Posthumous.

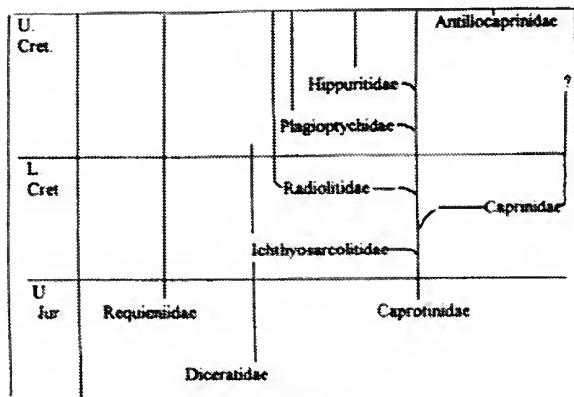


Figure 2. Phylogeny of rudist families after Skelton (1978, fig. 17).

*Coralliochama* probably dispersed along the margins of the circumequatorial Tethys Sea. *Coralliochama* is known from localities in the Caribbean; northeastern México; Baja California, México; California; and Tibet. Specimens of *Coralliochama orcutti* are found sporadically along the North American Pacific coast, from central California to Baja California. *Coralliochama orcutti* disappeared during the early to middle late Maastrichtian, before the Cretaceous-Tertiary (K-T) extinction event.

Thus far all specimens of *Coralliochama* found in California have been from west of the San Andreas Fault. Other rudistid genera and species are represented by specimens from the Lower Cretaceous (144-98.9 Mya) through the Turonian stage (93.5-89 Mya) from as far north as Siskiyou County, California, and southern Oregon. Few of these other rudistids have been identified, but they are not *Coralliochama*. All of the rudists from east of the San Andreas Fault are older than Coniacian (89-85.8 Mya) in age.

The purpose of this paper is to update information on *Coralliochama* and to discuss some of the known localities, stratigraphy, variations in morphology, and inferred life styles.

#### Institution abbreviations

LACMIP = Natural History Museum of Los Angeles County, Invertebrate Paleontology Department.  
SDNHM = San Diego Natural History Museum.  
USNM = National Museum of Natural History, Smithsonian Institution, Washington, D.C.  
CAS = California Academy of Sciences, San Francisco.

#### Systematics

Phylum Mollusca Linnaeus, 1758

Class Bivalvia Linnaeus, 1758

Subclass Heteroconchia Hertwig, 1895

Order Hippuritoida Newell, 1965

Superfamily Hippuritacea Gray, 1848

Family Plagioptrychidae Douvillé, 1888

(*nom. transl.* Skelton, 1978)

Genus *Coralliochama* White, 1885

#### *Coralliochama orcutti* White, 1885

The type specimens for *Coralliochama orcutti* are in the Smithsonian Institution (USNM), Washington, D. C. White based the species on 16 syntypes, (USNM 12698). Marincovich (1975) selected the specimen illustrated by White (1885, plate 2, figure 1) as the lectotype (renumbered USNM 186661). The remaining syntypes became paralectotypes and the four paralectotypes that Marincovich (1975) illustrated (figs. 3, 7, 17, 19) were also given new numbers. All of the original specimens were collected from the Upper Cretaceous Rosario Formation at Punta Banda, on the south shore of Todos Santos Bay, Baja California, México.

Zittel (1927) figured *Plagioptrychus* as having a pair of muscle scars in the free valve (FV) for muscle attachment that look like *Coralliochama* muscle fastening areas. He also mentioned that Caprinidae has myophores (muscle attachment areas). When White (1885) described and named *Coralliochama* he used the Von Zittel and Von Schimper (1881-1885) *Handbuch der Paläontologie* that contained a wide range of knowledge concerning rudists.

#### Material

Numerous specimens from Punta Banda are deposited at LACMIP. Their preservation varies; some have been sectioned, and Marincovich (1975) removed matrix exposing the shells of specimens he studied. Preparation entailed cleaning, slicing, and excavating each fossil for prominent characteristics. Most *Coralliochama* are in the condition they were in when collected in Punta Banda. These *Coralliochama* range in size from tiny juveniles to large mature specimens.

Specimens of *Coralliochama* from many localities in California are also stored at LACMIP. These are in



various states of preservation and the number of specimens varies from two from Jalama, Santa Barbara County, to many in other localities. The SDNHM has numerous specimens from Carlsbad, and four from Point Loma, San Diego County.

### Morphology of Punta Banda specimens

*Coralliochama orcutti* have large, ice cream cone-shaped shells. They grew upright, attached to the sea floor by the narrow end of the lower, cone-shaped valve. The upper valve mimics the scoop of ice cream cone shape with its bulging convex overhang. These clams grew in close proximity to each other. Mature specimens from Punta Banda range in size from 65 to 220.5 mm in height. Some specimens are medium-sized, “dwarfed”, or juveniles. A few juveniles show slight spiral coiling and a longitudinal protrusion is found on some specimens. The protrusion is an exterior bulge from the commissure to the distal end of the attached valve that may have accommodated siphons (Marincovitch, 1975). *Coralliochama orcutti* shells are commonly worn and many lack the outermost layer. Minute pores on the outer layer of the shells might have been formed by epibionts or possibly symbiotic algae emanating from the pallial canals in the shell walls (Gili et al., 1995; Seilacher, 1998). Some pores have tiny protrusions.

Rudist shells have three layers: an outer layer of prismatic calcite and two inner layers of porous aragonitic tabulae (Skelton, 1979). Although calcite and aragonite are both calcium carbonate ( $\text{CaCO}_3$ ), calcite is the more stable form of the two. Shapes of aragonitic tabulae vary from pyriform, just inside the shell margin, to polygonal farther toward the interior, to polyfurcate (several branches, not just bifurcate). Although, aragonite commonly alters to calcite, through diagenesis, the original areas of aragonite in *Coralliochama* are easily recognized.

The straight, conical right valve is attached at its small distal end, and is referred to as the attached valve (AV). The shape varies from conical to curved, twisted, or flattened. The surface of the AV has unevenly spaced vertical striations on the shell, from the commissure to the juvenile end. Minute, closely spaced concentric bands are also present as coarser concentric lines that may be growth lines. The outer layer of some of the conical shells from Punta Banda (LACMIP Loc. 2301) show faint raised beaded sculpture. The beads may have been formed from the indented concentric lines crossing the vertical striations on the shell, leaving small raised

squares (Figure 3). The porous polygonal aragonitic material (Figure 4) is thick on the inner shell layer or the dorsal side of the AV. The trace of the

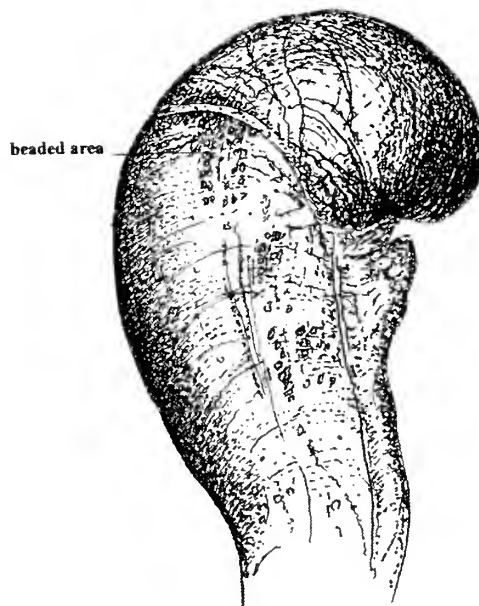


Figure 3. Beaded squares on outer shell, attached valve of *C. orcutti*, Punta Banda. Size: 143 mm.

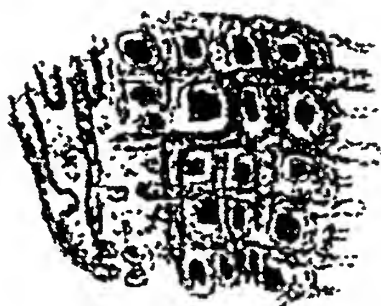


Figure 4. Porous polygonal aragonitic material, attached valve of *C. orcutti*, Punta Banda, x 4.6.

external ligament is a shallow groove that extends from valve tip to valve margin, off-center on the dorsal side of the attached valve. The active ligament was of short

to medium width. The commissure lip of the AV has an indentation where the ligament was inserted. The ligament probably did not extend far down the groove, as the part distant from the margin became nonfunctional as the valve grew. The groove may be visible on both valves. The ligament is discernible on a specimen from LACMIP loc. 5022 (Figure 5). The ligament follows the cap-shaped left free valve (FV) and in the AV the ligament follows the line of the hinge.

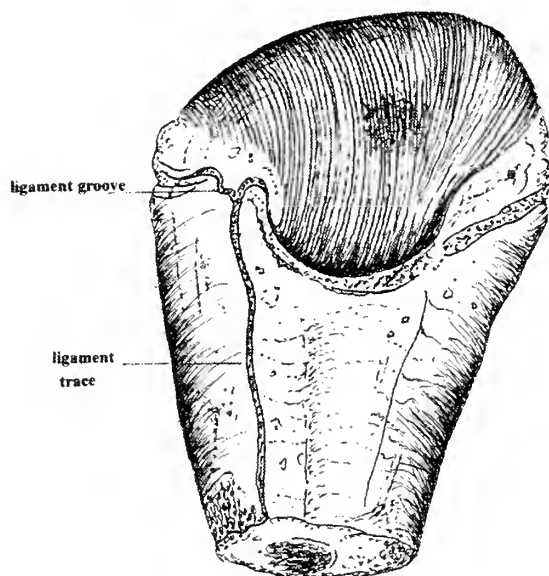


Figure 5. Ligament trace of *C. orcutti*, Punta Banda. Size: 142 mm.

The body cavity perimeter of the attached valve is usually round or oblong, but varies in size and shape. The body cavity is always off-center. A narrow calcitic rim encircles the body cavity in the AV (White, 1885). However, Marincovich (1975) concluded that the lining of the body cavity was made of compacted coalesced tubules. Although varying, the state of the encircling material is often calcitic (Figure 6) not aragonitic. The cavity is undivided vertically and extends for the length of the valve, tapering toward the distal end. Horizontal partitions of tabulae inside the body cavity may have intersected the lower parts of the valve and supported the animal as it grew upward. There are no extra accessory cavities formed by growth of myophores for muscle attachment in the conical valve (Coogan et al., 1969). Sockets for teeth are visible as cavities.

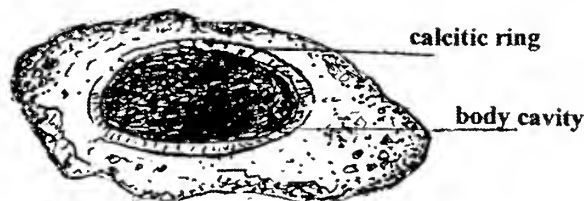


Figure 6. Calcitic ring on body cavity of attached valve of *C. orcutti*, Punta Banda. Size: 31 x 67 mm.

One socket is in the upper FV, between the two teeth and perpendicular myophore, and two shallow sockets in the conical valve accommodate the teeth of the FV.

Most bivalves, including rudists, have paired adductor muscles used to close the valves and keep them together. The Punta Banda specimens of *C. orcutti* have a thin perpendicular myophore in the FV that is an extension of the median tooth. It lies beside the body cavity, continuing from the FV toward the apex of the AV. This anterior myophore has an attachment area with a muscle scar visible below the superior edge. A callus or horizontal platform next to the posterior tooth of the FV may be a myophore for the posterior adductor muscle (Böse, 1906). The FV of *C. orcutti* is similar to

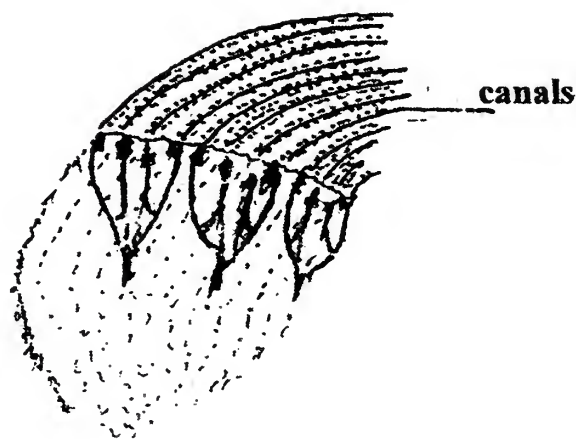


Figure 7. Detail of elongated canals and offshoots, free valve of *C. orcutti*, greatly enlarged, Fremont Canyon, Santa Ana.

the FV of *Plagioptychus arnaudi* Douvillé, 1888, from France, and both display a posterior myophore plate and vertical anterior myophore (Coogan et al., p. N794, fig. E259).

The FV varies in size and is swollen, rounded and incurved. It is usually less deep than the conical valve. The FV is beaked and the umbonal area large. The beak is usually central on the dorsal side and rarely overhangs the attached valve. The second or middle layer of the FV is composed of radial lamellae spaced 1 mm apart, that may have formed elongated pallial canals. These canals are longitudinal, following the curve of the FV, and have an internal layer below them of perpendicular bifurcating offshoots (Figure 7). The FV may have been able to rotate to slightly facilitate the opening of the valves over the large hinge teeth (Dechaseaux, 1969).

All rudists have highly modified heterodont hinge teeth, which are termed pachydont (thick teeth). In *C. orcutti* the FV contains two large teeth of unequal size (Figure 8). The anterior tooth is central and extends from the shell wall alongside the myophore plate.

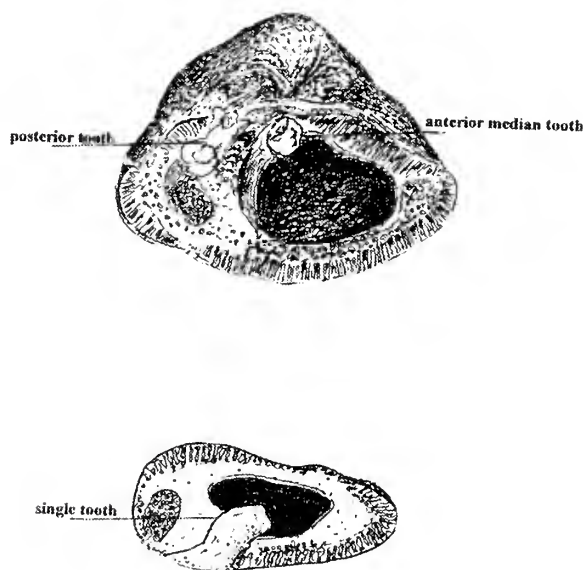


Figure 8. Teeth of *C. orcutti*. Top: free valve, 86 mm W x 70 mm H. Bottom: attached valve, 67 mm W x 33 mm H. Punta Banda and Carlsbad.

Adjacent, the thin myophore plate extends ventrally toward the opposite wall of the shell. The elongate posterior tooth is attached to the dorsal wall and also projects ventrally. Between the teeth is a socket for the insertion of the tooth in the AV. The attached valve has one tooth attached dorsally and two shallow sockets for the anterior and posterior teeth. Teeth of most *C. orcutti* vary in size and shape. The teeth may be calcitic.

## Variations

Marincovich (1975) described “dwarf” *C. orcutti*. These “dwarf” *C. orcutti* are known by the quite large cap-shaped free valve being almost larger than the conical valve. Some “dwarf” *C. orcutti* AV are small and twisted with the FV also larger than the upright valve (Figure 9).



Figure 9. Dwarf *C. orcutti*. Punta Banda. Size: 112 mm.

Teeth of “dwarf” *Coralliochama* vary more in shape and size than in mature specimens.

Another aberration is in the cone condition in which the body cavity shows uneven growth layers of aragonite material (Figure 10). These tabulae may have provided horizontal partitions shortening the body cavity as the shell grew, somewhat like nautiloid septa.



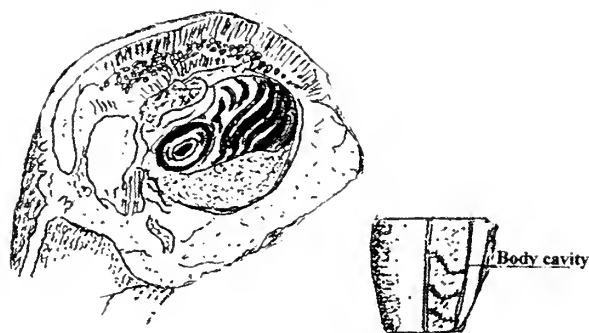


Figure 10. Body cavity of *C. orcutti* in cone attached valve and detail of vertical section showing septa, Punta Banda. Size: 77 mm W.

### Morphology and preservation of specimens from other localities

White (1895) assigned Maastrichtian specimens from the Gualala Formation in Sonoma and Mendocino Counties, California, to *Coralliochama orcutti*. From roughly 600 miles north of Punta Banda, rudists slightly smaller in size with free valves are the most prevalent. Although they are very similar, they have pallial canals that differ from *C. orcutti*. The canals are large for the rudists' size and some are rounded. *Coralliochama* from Gualala have small projecting calcitic areas (possibly a tooth-like tubercle for muscle attachment) in the FV, one between the anterior tooth and posterior tooth on the dorsal wall and one across from it on the ventral side. The posterior projection is smaller than the teeth but larger than the anterior projection across from it. This specimen (LACMIP loc. 5491) is illustrated here in Figure 11. Specimens from Gualala vary in size, some quite large and others small and broken. Other species found there include *Inoceramus*, *Glycymeris*, and *Baculites*.

*Coralliochama orcutti* are also found with other mollusks at Punta Banda (Saul, 1970). The common species are very small gastropods *Homalopoma euryostoma* White, 1885; *Echinoaxis spillingi* (White, 1885) and *Tympanotonos* (*Exechocirsus*) *totiusanctorum* White, 1885 (Saul, 1970; Kiel & Aranda-Manteca, 2002). The preservation of *Coralliochama orcutti* varies. Most are broken with the free valve more often attached. Strangely they are commonly attached on the ventral edge with the dorsal edge gaping a small amount. The outer layer is often eroded. Many *C. orcutti* are found cemented together (Marincovich, 1975). Many were distorted due to

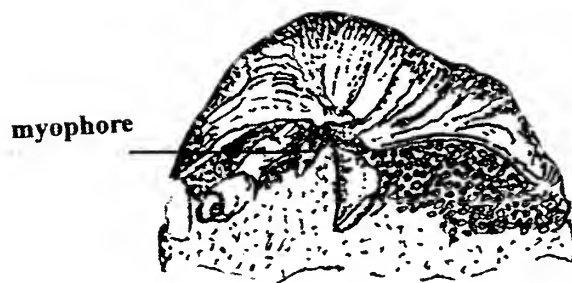


Figure 11. Small myophore of *C. orcutti*, Gualala. Size: 63 mm W x 40 mm H.

growing in clusters. Often the FV is rotated or twisted several degrees. The largest articulated specimens of *Coralliochama orcutti* are found at Punta Banda. The preservation is mostly poor in other Baja California sites.

Specimens identified by Taliaferro (1944) as *Coralliochama orcutti* from the El Piojo Formation at a fork in the Nacimiento River, Cape San Martin Quadrangle, Monterey County, are slightly larger and more abundant than those from Gualala, but the ones I have observed are too poorly preserved to identify specifically. Alex Clark, B. Clark, and H. Schenck have all noted brachiopods, ammonites, and mollusks (*Opis* sp.) at this site (Taliaferro, 1944). The assemblage consists of shallow-water mollusks (Howell et al., 1977).

On Jalama Creek, south flank of the of the Santa Ynez Range near Point Conception, *Coralliochama* was collected by Hanna, Church, and Gilbert not far east of Point Conception (Anderson, 1958). In 1929, J. Dorrance collected two *Coralliochama* specimens, now at LACMIP, from Jalama Creek, near Point Conception in Santa Barbara County, California, on the south side of the Santa Ynez Range. The one conical valve was easily recognizable as a *Coralliochama orcutti*. The specimens were of moderate size.

Debris Dam, Agua Caliente Canyon, also in the Santa Ynez Mountains, Santa Barbara County Espada Formation has *Coralliochama* from a locality that may be Campanian (83.5-71.3 Mya). There is doubt about the boundaries of the Espada Formation. The specimens are not available for study (Dibblee, 1966).

In the Chatsworth Formation in the west-end of Simi Hills, Ventura County, California, only the tops of free valves and fragments have been found. These are probably *Coralliochama orcutti*. They are small in size, incomplete, and display some polygonal tabulate material

and vertical striations. They were in the upper part of the formation with very few other fossils. Specimens of these rudists, collected by Saul and Saul in 1973, were mentioned by Saul & Alderson (1981).

Between Oak Flat and Fremont Canyon in the Santa Ana Mountains of Orange County, California, small specimens of broken shell remains are present in the Shultz Ranch Member of the Williams Formation. Preservation of *Coralliochama* at this locality differs greatly from all other localities. Here *Coralliochama* occurs with another rudist and other mollusks and coral collected by Popenoe and Schoellhamer in 1951 (Sundberg, 1982). The valves are not articulated on these small specimens and both valves are represented. The tabulae on the second layer are more spaced. Some shell material is preserved and the layers defined, some looking like foliation. Recrystallization may have occurred in the aragonitic third layer.

Schoellhamer et al. (1981) found small valves of *Coralliochama* in the Santa Ana Mountains, Black Star Canyon, in the Shultz Ranch Member, where the associated fauna indicates a shallow marine environment. *Coralliochama orcutti* there are similar to the Simi Hills specimens (Sundberg, 1980). One Black Star Canyon specimen shows juvenile coiling.

The Santonian (85.8-83.5 Mya), Robinson Ranch specimens are not available for study (Sundberg, 1993). They are said to be *Coralliochama*.

At Carlsbad (Campanian-Maastrichtian) in San Diego County, there are many isolated *Coralliochama* valves or parts of valves of good size. They are large and some are very thick but not as tall as the Punta Banda specimens. However, clusters or bouquets of rudists found there may be a different species or even genus. The AV of these clusters of small rudists is cylindrical, erect, thin, and the exterior is smooth. One specimen from Carlsbad has a large callus in the same position on the shell as a few Gualala specimens, so extra myophores may occasionally be present in the *Coralliochama*.

In San Diego County, outcrops of the Point Loma Formation, of the Rosario Group, on Point Loma, yielded specimens of *Coralliochama orcutti* but most are poorly preserved. The Point Loma Stanford Collection at CAS mentions more than one locality on Point Loma. The largest specimen from there is 150 mm in height (Abbott, 1999). At La Jolla Shores, *C. orcutti* is not abundant, but is found with ammonites, coral, and other mollusks. *Coralliochama* there are said to be white and imbedded in hard sandstone. The La Jolla specimens are not available for study.

South of Punta Banda at Punta China, Punta San José, and Cabo Cabras, all Baja California, are localities where *Coralliochama* has been found (Kodama & Ward, 2001). At Santa Catarina, farther south in Baja California, the scrap of rudist found may not be *Coralliochama*.

### Inferred life style

Rudists were epifaunal. The populations of *C. orcutti* at Punta Banda form a lithostome (mass of rock built by mostly sedentary organisms). *Coralliochama orcutti* may have grown close to the shore. It probably grew upright attached to the substrate, although some were found recumbent and free living (Marincovich, 1975). They may have been indicative of a very shallow-water facies in a low energy habitat (Saul, 1970). In most of the various localities where *Coralliochama* is found, no other species of rudist occurs. However, in Fremont Canyon in the Santa Ana mountains *C. orcutti* and a rudist in the family Hippuritidae have been discovered. In Carlsbad there may be another species of rudist, or other mollusk found in clusters that look like mushrooms.

The hinge of *C. orcutti* must have been strong because the specimens are often found with valves articulated (at Punta Banda). The opening of the valves may have been narrow and the gape not large. Possibly the free valve outer layer was a smooth calcitic deposit covered by an overlapping mantle, as in *Cyprea* as suggested by Gili et al. (1995). The affixed life style of *Coralliochama orcutti* indicates it was a filter feeder, possibly entrapping detritus and plankton on the extended mantle (Skelton, 1979). Not much of the outer shell layer is preserved on any of the specimens in the LACMIP Collection. The body size was probably small in relation to shell size and amount of shell material. The shells may have been light in weight with so much space enclosed by the open grid of the aragonitic tabulae.

Although both incurrent and excurrent siphons may have been present, Kauffman (1969) considered the presence of incurrent and excurrent siphons doubtful in any rudists, but Marincovich (1975) mentions siphons in *Coralliochama*. The longitudinal protuberance on the AV may have indicated a position for a siphon. *Coralliochama orcutti* are unlike many burrowing bivalves that have a need for siphons. Little is understood concerning the soft parts of rudists: probably no protrusible foot, used by infaunal forms for burrowing and by bysally attached clams for attachment

(rudists were epifaunal and many such as *Coralliochama* had shells cemented to the substrate). However, in bivalves with a weak ligament, the foot commonly assists in opening the valves (Saul, personal communication, 2002). Any conclusions about their gill (ctenidia) structure, nervous system, mouth, labial palps, excretory method, mantle edge placement, tentacles, color, or pearl formation, are entirely speculative and may have varied between genera of rudists. Whether there were differences regarding male and female rudists or if they were hermaphroditic is not known.

The canal-like structures of thin-walled porous tabulae resemble those of tabulate corals. These small polygonal plates appear vesicular, as in fossil or Recent oysters of the Pycnodontinae (Stenzel, 1971). The tabulae structure of the Plagiptychidae may have added strength to the shell (Palmer, 1928; Chubb, 1971) and allowed for faster growth by creating a honeycomb of spaces and thus reducing the amount of aragonite deposition (Perkins, 1969). If algae had lived internally in the tabulae spaces, the algae might have nourished the bivalves and kept them damp when exposed during low tide (Gili et al., 1995). Algae live in the mantle tissue of *Tridacna* and some other Recent clams. One of the Cardidae, *Corculum cardissa* (Linnaeus), has translucent areas in its shell. Light is provided by minute holes in the shell outer layer of some mollusks enabling them to grow and use algae (Vogel, 1975). There are many small holes on the valves of *C. orcutti*. In some specimens an extra shell layer seems to be present, as seen in specimens from Fremont Canyon, in the Santa Ana Mountains.

There are many possible causes for *Coralliochama* extinction: regressive seas, volcanic activity, salinity changes, tectonic activity, temperature fluctuations, highly specialized morphological constraints, etc. (Seilacher 1998; Johnson & Kauffman, 1990). Johnson (1999) stated that rudists lived in warm, highly saline waters. *Coralliochama* is more generalized and shows a lower species diversity than many rudists and had a long stratigraphic range. *Coralliochama* survived into the early Maastrichtian in California. Predation on rudists is not commonly recognized and there are none noted on *Coralliochama*. There are no signs of damage from borings by sponges, algae, and worms on *Coralliochama*. Damage to other rudists (Kauffman & Sohl, 1974) may have been minimal or caused after death.

### Geologic range

Specimens assigned to *Coralliochama* have been reported from the Albian (Figure 11) (Early Cretaceous) in Baja California, Texas, and west Louisiana (Johnson, 1999); from the Cenomanian (99-93.5 Mya) of central Cuba; from the Turonian of central Cuba; and from the Campanian of Baja California, northeastern México, Belize, northern Guatemala (Johnson, 1999) and Tibet (Gou & Shi, 1998). Specimens from the Upper Campanian are known from Orange and San Diego Counties, in California, Baja California, and north-eastern México.

*Coralliochama gboehmi* Böse, 1906; *Coralliochama* n. sp. Muellerried, 1931, and *C. flouriei* Damestoy, 1965, are found in northeastern México. Southern México, northern Guatemala, Belize, and central Cuba also have *Coralliochama*. Maastrichtian localities are known from California, Baja California, southern México, northern Guatemala, Belize, and central Cuba. This information is compiled from published literature, unpublished reports of government workers, and field data which comprised the data base for the rudist genera, ages, and geographic locations (Johnson, 1999).

On the Pacific Coast in the Santonian? to Maastrichtian from Baja California to central California, *C. orcutti* is found in many deposits. Whether the Albian *Coralliochama* is *C. orcutti* from Baja California (Johnson, 1999) is not known; any Albian *Coralliochama* from Baja California is highly improbable, as the records are inconclusive.

A study of Late Cretaceous strata of California, compaction-corrected paleomagnetic data from the Peninsular Ranges and Salinia terranes indicates that rudists (*Coralliochama orcutti*) were restricted to paleolatitudes between 34° and 40°N (Kodama & Ward, 2001).

A chance find in the Tibetan region of China enabled Gou and Shi (1998) to describe three rudist localities that contained *Coralliochama*: *C. anomalusa*, from the Langshan Formation, Upper Cretaceous of the Gegyai-Shiquanh region (Gou & Shi, 1998); *C. sp.* from the Coqen-Gerzze region Langshan Formation, Campanian; and *C. sp.* from the Tielongtan Group are Campanian in age (Yang et al., 1982). This is only part of the molluscan fauna which includes other rudists found in the region that encompasses the entire Luokezongshan area in Tibet.



### Discussion of Environment

At Punta Banda *Coralliochama orcutti* are found in a gray coarse-to-fine-grained tan sandstone (Marincovich, 1975). Cobbles and volcanic rocks are strewn close by. Thick beds of bioclastic debris contain the rudists. The sea cliff is 21 meters high, and consists of undisturbed shallowly-dipping beds with mollusks throughout (Marincovich, 1975). Many *Coralliochama* are found in situ. The strata that contain abundant *Coralliochama* specimens are exposed along the north side of the point for a distance of about three miles and about one mile inland according to Marincovich (1975). Specimens can be collected at low tide at the base of the cliff (Figure 12).

Cretaceous marine rocks of the Point Loma Formation exposed in the sea cliffs near La Jolla Shores consist of a thick sequence of shallow-marine sandstone and mudstone (Abbott, 1999). The lithology of Point Loma is characterized by thin layers of graded marls and sandy and calcareous shales interspersed with conglomerates and coarse sandstone called flysch sediment. These sediments are found in elongate depressions bordering land masses and are known in the Upper Cretaceous.

The Carlsbad locality may have been located near a mouth of an inlet, rather shallow in depth and with large cobbles. Carlsbad changes from coarse sediment with cobbles to fine grained sediment. As one goes upland away from the shoreline, sand changes to mostly mud.

The Santa Ana Mountains localities indicate a shallow marine environment for *Coralliochama*. At Robinson Ranch, in the Holz Shale Member, the stratum consists of dark gray mudstones, shale and sandstone. In Fremont Canyon, Schults Member of the Williams Formation, *C. orcutti* are found in a conglomerate and sandstone lithofacies. There, conglomerate clasts are well rounded. This locality is judged to represent a shallow offshore bar (Sundberg, 1982).

The Shultz Member is marine to non-marine. In the Simi Valley, the Chatsworth Formation (where the rudists occur), is mostly coarse-grained sandstone and conglomerates. The *Coralliochama* were possibly transported down-slope by turbidity currents to their present location of coarse-grained sediment (Kodama & Ward, 2001).

Near Mono Debris Dam the section of the upper part of the Espada Formation along Little Caliente Canyon has yielded Late Cretaceous fossils (Page,

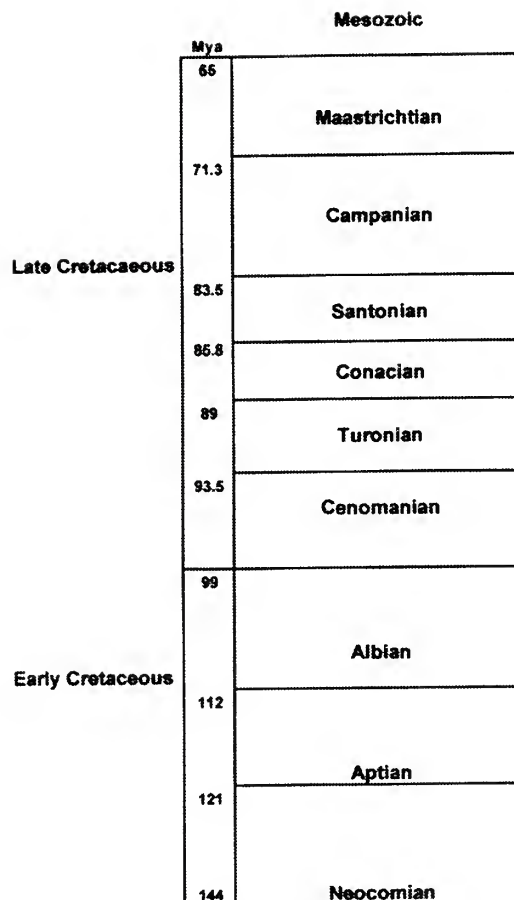


Figure 12. Cretaceous chart of stages from GSA, 1999.

Marks & Walker, 1951). A conglomerate bed in this section yielded *C. orcutti*. The few additional fossils from there are: *Acila demeisa* Finlay, 1927; *Baculites* sp.; *Perissitys pacifica* Popenoe & Saul, 1987; and an unidentified ammonite. From these and other fossils, and the age of the overlying formation, *Coralliochama* can be considered not older than Santonian nor younger than middle Campanian (Elder et al., 1998). South of the Santa Ynez River in the Blue Canyon area several collecting sites have produced *Coralliochama*.

In the Jalama Formation fossils are imbedded in bioturbated sandstone indicating a nearshore, possibly high energy, depositional environment (Kodama & Ward, 2001). *Coralliochama orcutti* were probably transported to the area.

The Cape San Martin Quadrangle facies is made up of Cretaceous basal arkose sandstone matrix and coarse-grained conglomerates (Howell et. al., 1977).

There are indications of transport to a deep sea fan channel.

The Gualala Formation *Coralliochama* occur in coarse dark gray mudstone inter-bedded with fine-grained sandstone. They also occur in the Anchor Bay Member sandstone and conglomerates. The mollusks may have been transported from a shallow-water environment.

### Discussion

Rudists are of biostratigraphic importance and an aid in recognizing late Mesozoic areas with a tropical climate. The chemical composition of the sea-water may have differed from that of Recent oceans (Johnson, 1999). This may have been opportune for the growth of *Coralliochama* bivalves, possibly nurturing them with chemicals no longer present or in different concentrations in the sea. Most were found in shallow-water facies, or lagoon environment and possibly exposed during low tide.

Rudists are very diversified and different from modern clams (Figure 13), making it difficult to understand their physiology. Many conflicting and perplexing theories have been proposed concerning their functions. *Coralliochama orcutti* White, 1885, was the first rudist described from California. There are eleven known sites in southern California (Figure 14) where *C. orcutti* is found. Its geologic range stretches from possibly Santonian to the middle Maastrichtian. *Coralliochama orcutti* varies from locality to locality in type of preservation and in several points of morphology such as: decrease in size with increasing latitude, extra myophore placement, size of tabulae, and possible extra shell layers. Vogel (1975) reported photosymbiosis in other rudists which could be somewhat similar to *C. orcutti*, this shows a possibility of algal growth in *C. orcutti* mollusks. Eliuk (1998) attributed large growth in megalodonts (ancestors of rudists) and megalodont-like shells, i.e. rudists, to symbiotic association with algae. *Coralliochama orcutti* grow to quite a large size which lends possibility to algal intervention. *Coralliochama orcutti* apparently had a very narrow distribution along the Pacific Coast. The species *C. boehmi* Böse, 1906, and *C. muellerried* Muellerried, 1931, all may be the same species (i.e. *C. orcutti*) as the morphological differences are so slight (Bass in Kodama & Ward, 2001). *Coralliochama orcutti* tend to be very varied. Gou in 1998 who reported *Coralliochama* in Tibet (China) put new light on their route of dispersal, if identified correctly.

During the late Campanian to early Maastrichtian *Coralliochama* radiated and speciated and became extinct by the middle Maastrichtian. Rudists may have been ecologically analogous to archaeocyathids of the Cambrian, Permian richtofenid brachiopods, some sponges, and rugose corals, many of which lived similarly and were populations of "reef" builders which became extinct. Like, dinosaurs, ammonites, and the clam *Inoceramus*, rudists became extinct at various times during the Cretaceous.

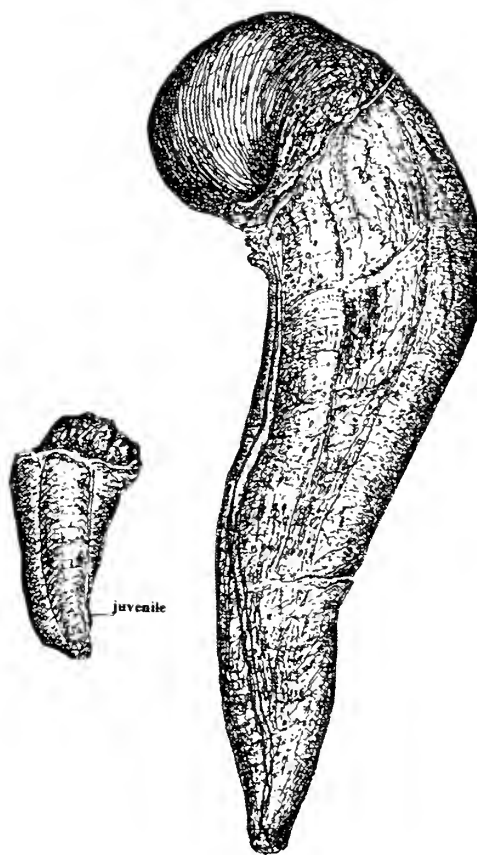


Figure 13. Other *Coralliochama orcutti*. Adult: 229 mm; juvenile : 67 mm.

### Acknowledgments

I should like to express my gratitude to all in the Invertebrate Paleontology Section of the Natural History Museum of Los Angeles County for access to their comprehensive collection of *Coralliochama orcutti*. I especially value the help of LouElla Saul for the critical analysis of this paper and help in finding obscure papers

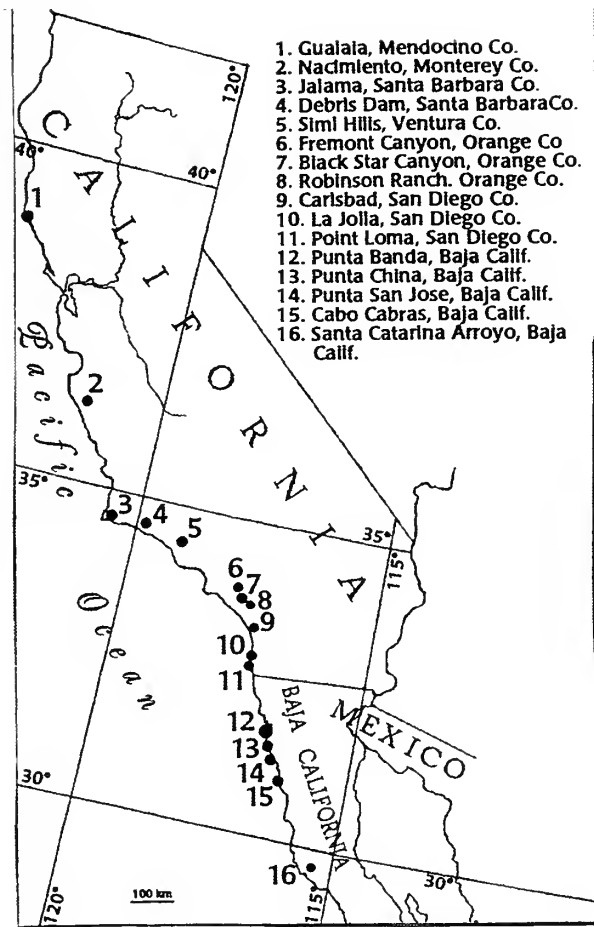


Figure 14. Map of *Coralliochama orcutti* localities in California and Baja California.

containing information on *Coralliochama orcutti*. The encouragement of Lindsey Groves and his help with references deserves recognition. My gratitude goes to George Kennedy for reading sections of the paper and to Harry Filkhorn for his knowledge of caprinids and help with the diagnosis of *Coralliochama* and editing this paper. I also want to thank Tom Démeré of the San Diego Natural History Museum for allowing me to study his *Coralliochama* specimens. My sincere appreciation to Peter Skelton for his inspiration concerning rudists.

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## MALACOLOGICAL NEWS

### 2005 Meeting of the Latin American Malacological Congress

Organized by the Smithsonian Tropical Research Institute Panamá, the Universidad de Panamá, and COCLAM, malacologists are invited to the VI Latinamerican Malacological Congress to be held in Panamá City, Panamá from 4-7 July 2005

Important dates: 3/31/05 - deadline for abstract submission; 3/30/05 - deadline for low rate registration; 5/4/05 - Congress starts.

For further information, contact Helena Fortunato (e-mail: [fortunae@anconn.si.edu](mailto:fortunae@anconn.si.edu))

### Conchologists of America Grants 2005

The Conchologists of America Grants Committee is requesting applications for the 2005 COA Grants Program. Grants in amounts up to \$1500 will be available to qualified persons undertaking field or laboratory research on Recent or fossil mollusks.

The competitive grant awards are made only to citizens or permanent residents of the Americas, including the Caribbean nations, or to students attending graduate schools in the United States. American students pursuing academic degrees outside the US are also eligible.

The committee includes Dr. Henry Chaney (Santa Barbara Museum of Natural History) and Dr. Gary Rosenberg (Academy of Natural Sciences of Philadelphia. Please check the Web at <http://www.conchologistsofamerica.org/grants/> for more information, application instructions, and other requirements. The deadline is February 28<sup>th</sup>.

### The National Evolutionary Synthesis Center (NESCENT) announces fellowships

NESCENT calls for proposals for up to 10 Post Doctoral and 5 Sabbatical Fellowships. Please see <[www.nescent.org](http://www.nescent.org)> for details about applications.

Post Doctoral and Sabbatical Fellowships will support ambitious, synthetic research on any aspect of evolutionary biology and relevant disciplines.

Sabbatical applicants should take note of our full-salary "targeted sabbatical" program to attract individuals interested in developing community computational infrastructure for evolutionary biology, and for evolutionists from Minority Serving Universities.

- Open to fellows of ALL nationalities.

- Research projects to be carried out primarily on-site.

- We will begin reviewing applications on Feb. 1, 2005.

- We will stop accepting applications on Mar. 1, 2005.

- Starting dates will be before Sept. 2005.

Proposals can include any type of synthetic project, but should not include time at the bench or in the field. Projects can be entirely theoretical and may involve developing analytical methods and software.

Projects can also be purely empirical, synthesizing data from: - the literature - existing databases - new databases built with NESCENT help - visits to museums or other data centers - cooperating laboratories anywhere in the world.

Cliff Cunningham, Director,  
National Evolutionary Synthesis Center, Box 90338,  
Duke University, Durham, NC 27708.  
[www.nescent.org](http://www.nescent.org)

## NINTH ANNUAL SCUM MEETING

The ninth annual meeting of the Southern California Unified Malacologists (SCUM) was held on 22 January 2005 at the City of San Diego's new Environmental Monitoring and Technical Services Laboratory. This state-of-the-art building houses San Diego's Ocean Monitoring Program. The co-sponsor for the meeting was the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT). Refreshments were available at 8:00 a.m. and the meeting was officially convened at 9:15 a.m. There were 28 attendees (Figure 1).

Kelvin Barwick, hosted the meeting and opened it by welcoming everyone. The morning's session consisted of a round of self introductions with a brief statement from each of the attendees on their interests and accomplishments for the previous year. Kent Trego discussed his numerous projects with various workers at Scripps Institution of Oceanography (SIO) and some of his abstracts that were published last year at the Western Society of Malacologists (WSM) meeting. Don Cadien talked of his work with aplacophorans and his attempt to develop a method of identification without dissection. John Ljubenkov talked briefly on his interests concerning cnidarian-mollusk interactions. Daniel Geiger discussed the recent acquisition and installation of a Leitz Scanning Electron Microscope at the Santa Barbara Museum of Natural History (SBMNH) and his continuing interest in world-wide scissurellid species. Jim McLean gave a status update on his work on the gastropods from Kamchatka to northern Baja California. He showed some typical binders of the types of images and descriptions that would be contained in the final work. He has just about completed the gastropod input for the revised *Light's Manual* and he is also busy on a book on the world-wide species of the family Liotiidae which will contain descriptions of approximately 300 new species. George Davis stated that a PDF file is now available listing the crustacean species housed at the Natural History Museum of Los Angeles County (LACM). Lindsey Groves has finished work on the Recent UCLA mollusk collection and has just completed three papers that will be published in *The Festivus*. He also discussed his continued activities with fossil cypraeids. LouElla Saul has published a paper on Cretaceous argonauts. Nancy Schneider spoke of collecting fossils in Baja California Sur with her



Figure 1. Row 1: George Davis, Wes Farmer, Kelvin Barwick. Row: 2: Daniel Geiger, Phil Liff-Grieff, Terry Rutkas, LouElla Saul, Judith Garfield, Henry Ruhl, Ángel Valdés, Kent Trego, David Lawrence, John Ljubenkov, Larry Lovell Row 3: Dan Ituarte, Scott Rugh, Mary Stecheson, Lindsey Groves Row 4: Don Cadien, Tony Phillips, Seth Jones, Charles Powell Row 5: George Kennedy, Jim McLean, Carole Hertz Row 6: Bill Schneider, Nancy Schneider, Hans Bertsch, Jules Hertz.

husband Bill and her recent paper in *The Festivus* describing this collection which they have donated to SBMNH.

The presentation which elicited the most discussion was presented by Bill Schneider, who is an avid fisherman. He recently returned from deep-sea fishing off Hurricane Bank, which is approximately 1000 miles south of San Diego and approximately 200 miles southwest of Clarion Island. One of the fisherman on the boat decide to fish for grouper and put his line down to the bottom, a depth of approximately 420 feet. His line caught something solid and up came a seven foot piece of black coral. It was going to be thrown back, but Bill was able to lay claim to it. He brought it to the meeting and on the base of the coral is a cluster of a rarely seen gastropod, *Rhizochilus antipathum* Steenstrup, 1850. Pieces of coral containing specimens of *Chama arcana* were also brought up with the black coral and were available for viewing. Other material brought up was already on the way to SBMNH for identification. There was much discussion about this find and it will hopefully result in a published report. A number of pictures showing the black coral and the cluster of gastropods were taken by Wes Farmer.

After the morning break, there was a continuation



of short presentations from the attendees. Carole Hertz told of working with Barbara Myers on the muricoidean collection at the San Diego Natural History Museum (SDNHM). Larry Lovell of SIO told of new geographic and depth ranges for the Vesicomyidae. He also reported receipt of material from depths of 200-300 meters from geology cruises to southern Baja California and Unimac Island. Ángel Valdés of LACM reported on a manuscript that he and Kelvin Barwick coauthored on a new *Akera* that will be published soon in *The Nautilus*. Terry Rutkas reported on the Los Angeles Shell Club, the oldest club in the USA (originated in 1902). Phil Liff-Grieff reported that he is a collector, particularly interested in land snails, micromollusks and chitons. He is an associate at the LACM and is working on a wet collection of land snails. Seth Jones said that he might have material available for study after his company finishes their evaluations. George Kennedy is looking at material from the Bay Point Formation from excavations in downtown San Diego, and Charles Powell is working on late-middle to middle-late Miocene material from Salinas Valley.

Kelvin Barwick presented an overview of the Environmental Laboratory (City of San Diego EMTS Division Laboratory). The 32,000 sq. ft. facility opened in January 2004. There are 66 people employed at the facility, 28 of them work on marine biology and ocean

operations. The City of San Diego Ocean Monitoring Program monitors both the Pt. Loma Ocean Outfall and the South Bay Ocean Outfall. Kelvin also gave a brief review and history of SCAMIT. Henry Ruhl's presentation was on collecting at Station M, approximately 130 miles west of Santa Barbara, at a depth of approximately 4,000 m. He showed pictures taken remotely of the sea bottom revealing a mysterious squid, a volute and a bivalve, among other creatures. He also used time-lapse photography of animal activity on the sand bottom.

At this point, the group adjourned for lunch and the group photograph. This was followed by a very interesting tour of the facility. After this the group reassembled to hear two presentations, one by Hans Bertsch and the second by Wes Farmer. Hans discussed opisthobranch papers he has coauthored this past year as well as those on which he is currently working. He talked of naming several new species and how he arrived at the names for these species. Wes made a PowerPoint presentation capturing the changes in appearance of the cliffs at Torrey Pines Beach during a week of rain.

The last business of the day was scheduling the location for next year's SCUM meeting. Daniel Geiger volunteered that the Santa Barbara Natural History Museum would host the meeting in 2005.

Jules Hertz

## BOOK NEWS

The Club has received a very generous donation for its library from Don and Jeanne Pisor of the book *Tailandia*. This soft-covered 8½ x 11 inch book is Supplement 9 of *La Conchiglia* (yearbook for 2003) on "Holocene and Recent shallow soft-bottom mollusks from the northern Gulf of Thailand area: Scaphopoda, Gastropoda, additions to Bivalvia." The authors are Elio Robba, Italo De Geronimo, Niran Chalmanee, Mauro Pietro Negri and Rossana Sanfilippo.

The volume is bilingual— each text page in Italian and English, the English translation by Bruce Neville. The book is 288 pages with 37 fine, clear, black- and white plates illustrating most of the species; 3 maps of

the area (as figs. 1-3); reference section; and an appendix listing all the species collected, denoting type and other significant material in the BMNH, whether specimens were live or dead and fossil or Recent.

The book covers 336 species of which 23 are proposed as new and 108 are unidentified; 317 are scaphopod and gastropod species and in the bivalve section, are revisions to nine previously published species, and descriptions of another 19 obtained subsequently.

This volume will be available for circulation at the February general meeting. Our thanks to Don and Jeanne Pisor for this library contribution.



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ANDERSON, ROLAND, 2000 Minor E. #8, Seattle, WA 98102, (206) 329-5815, E-mail: roland.anderson@ci.seattle.wa.us

ARNOLD, TERRY, 2975 B St., San Diego, CA 92102, (619) 235-8181, FAX (619) 235-0016, E-mail: tarnold@computer.org

BARWICK, KELVIN L., City of San Diego, EMTS Laboratory, 2392 Kincaid Rd., San Diego, CA 92101-0811, (619) 758-2337, E-mail: kbarwick@sandiego.gov

BEDELL, HARRY, 23852 Pacific Coast Hwy #178, Malibu, CA 90265, (310) 456-0012, E-mail: malibuone@aol.com

BERSCHAUER, DAVID & FELICIA, 25461 Barents St., Laguna Hills, CA 92653, (949) 457-9210, FAX (949) 457-9450, E-mail: dpb@berschauerlaw.com

BIELER, RÜDIGER, Field Museum of Natural History, Dept. of Zoology, 1400 S. Lake Shore Dr., Chicago, IL 60605-2496, (312) 665-7720, E-mail: bieler@fieldmuseum.org

BISHOP, JOHN A., 3026 Freeman, San Diego, CA 92106, (619) 223-6038, E-mail: jandebishop@cox.net

BISHOP MUSEUM LIBRARY, 1525 Bernice St., Honolulu, HI 96817-2704, (808) 848-4148, E-mail: bjshort@bishopmuseum.org

BOWER, KATHY, 224 Stanley Dr., Santa Barbara, CA 93015, (805) 886-6916, FAX (805) 563 4376, E-mail: kbower@gte.net

BOYD, EDWARD, 18218 Paradise Mountain no. 197, Valley Center, CA 92082-7000, (760) 749-9033, E-mail: patsyboyd@webtv.net

BRATCHER-CRITCHLOW, TWILA & TOM, 939 Coast Blvd. #15H, La Jolla, CA 92037, (858) 456-7241

BROWN, CHRIS, 4575 N. Ave. del Cazador, Tucson, AZ 85718, (520) 299-1890, E-mail: flashcove@mindspring.com

BURCH, TOM & BEATRICE, 3599 Sylvan Pines Circle, Bremerton, WA 98310-6841, (360) 373-1299, FAX (360) 373-1323, E-mail: taburch@comcast.net

CADIEN, DONALD B., 1006 W. 37<sup>th</sup> St., San Pedro, CA 90731, (310) 833-0312, E-mail: musicmr@cox.net

CALIFORNIA ACADEMY OF SCIENCES, J.W. Mailliard, Librarian, 875 Howard St., San Francisco, CA 94103

CATARIUS, LARRY, 4173 Galt St., San Diego, CA 92117, (858) 270-4376

CHANEY, BARBARA, 1633 Posilipo Lane, Santa Barbara, CA 93108, (805) 969-1434

CHANEY, HENRY W., 170 La Vista Grande, Santa Barbara, CA 93103, (805) 682-4711 ext. 334 (work), FAX (805) 963-9679 (home), E-mail: hchaney@sbnature2.org (work)

CLARK, ROGER N., 1839 Arthur St., Klamath Falls, OR 97603-4617, (541) 883-7582, E-mail: insignis@charter.net

CLOVER, PHILLIP W., P.O. Box 339, Glen Ellen, CA 95442, Phone/FAX (707) 996-6960

COAN, EUGENE V., 891 San Jude Ave., Palo Alto, CA 94306-2640, (650) 493-8242 (home), (415) 977-5681 (work), FAX (415) 977-5790, E-mail: gene.coan@sierraclub.org

DAUGHENBAUGH, JOHN, 203 N. Wilton Pl., Los Angeles, CA 90004-4025, (213) 614-4460, E-mail: shoduffy@attbi.com

DEEMS, RON, 1768 Hermes, San Diego, CA 92154-2814, (619) 424-3750

DOI, MATTHEW S., 16209 Taylor Ct., Torrance, CA 90504-1902, (310) 329-3201

DULLAS, NORMA M. & WILLIAM, 13231 North 65<sup>th</sup> Dr., Glendale, AZ 85304, (623) 979-8758, E-mail: norbidullas@aol.com

EERNISSE, DOUGLAS J., Dept. of Biological Science, MH 282, California State University, Fullerton, CA 92834-6850, (714) 278-3749, FAX (714) 278-3426, E-mail: deernisse@fullerton.edu

EMERSON, WILLIAM K., 10 E. End Ave. Apt. 18E, New York, NY 10021-1184, (212) 879-7645 (home), (212) 769-5714 (work), FAX (212) 879-7645, E-mail: emerson@AMNH.org

EVERSON, GENE, 500 Nottingham Pkwy., Louisville, KY 40222-5026, (502) 429-5788, E-mail: supersheller@insightbb.com

FARMER, WES, 3591 Ruffin Rd. #226, San Diego, CA 92123-2561, (858) 576-2143, E-mail: wmfarmers@adnc.com

FLENTZ, MARY & JOHN B., 4541 Lambeth Court, Carlsbad, CA 92008-6407, (619) 434-2522, E-mail: jbfleantz@adelphia.net

FORSYTH ROBERT, P.O. Box 3804, Smithers, British Columbia, Canada VOJ 2N0, (250) 847-6699, E-mail: r.forsyth@telus.net

FRANK, WILLIAM M., 1865 Debutante Dr., Jacksonville, FL 32246-8645, Phone/FAX (904) 724-5326, E-mail: bill@jaxshells.org

GARCÍA, EMILIO F., 115 Oak Crest Dr., Lafayette, LA 70503, (337) 232-2662, E-mail: efg2112@louisiana.edu

GARFIELD, JUDY, Biotext, P.O. Box 332, La Jolla, CA 92038-0332, (858) 643-1113, FAX (858) 483-8140, E-mail: jgarfield@ucsd.edu

GERRODETTE, BILLEE L. & GEORGE, 6333 La Jolla Blvd. #171, La Jolla, CA 92037, (858) 454-5788

GOLDAMMER, MARILYN & JIM, 10051 Shcaba Way, San Diego, CA 92129, (858) 484-0575, E-mail: mgoldammer@san.rr.com

GORI, SANDRO, Via Sernesi 7, 57123 Livorno, Italy

GREEN, DAVE, LUCILLE & KRISTEN, 6610 Baker Ct., Colleyville, TX 76034, (817) 421-6887, E-mail: dgreen803@comcast.net

HATFIELD MARINE SCIENCE CENTER, Marilyn Potts Guin Library, Oregon State University, 2030 S. Marine Science Dr., Newport, OR 97365

HERRMANN, RICHARD & GINNY, 12545 Mustang Dr., Poway, CA 92064, (858) 679-7017, FAX (858) 679-3346, E-mail: rbherrmann@eox.net

HERTZ, JULES & CAROLE M., 3883 Mt. Blackburn Ave., San Diego, CA 92111, (858) 277-6259, E-mail: cmhertz@pacbell.net

HEWITT, SUSAN & EDWARD SUBITSKY, 435 E. 77<sup>th</sup> St. Apt. 3G, New York, NY 10021, (212) 628-6706, E-mail: hewsub@earthlink.net

HICKMAN, CAROLE S., 2001, University of California, Dept. of Integrative Biology, Berkeley, CA 94720-3140, (510) 642-3429, FAX (510) 642-1822, E-mail: caroleh@socrates.berkeley.edu

HOLLMANN, MICHAEL, Stockumer Heide 44, D-58454 Witten, Germany, 02302-944-255, FAX 0234-230-4225, E-mail: Michael.Hollmann@ruhr-uni-bochum.de

HOUSTON, ROY S., Dept. of Biology, Loyola Marymount University, Loyola Blvd. at West 80th St., Los Angeles, CA 90045, (213) 642-3126 (work), (310) 329-6444 (home), E-mail: rhouston@lmu.edu

HUMBIRD, WAYNE & PATTY, 54 Tamarind Ct., Lake Jackson, TX 77566, (979) 265-1320, E-mail: whumbird@csinternet.net

JACKSON, JOHN A., 11558 Rolling Hills Dr., El Cajon, CA 92020, (619) 579-8405, FAX (619) 579-7901, E-mail: odysey@adnc.com

JOFFE, ANNE, 1157 Periwinkle Way, Sanibel Island, FL 33957, (941) 472-3151, FAX (941) 472-3153, E-mail: sanibelchiton@aol.com

JONES, SETH J., Merkel & Associates, Inc., 5434 Ruffin Rd., San Diego, CA 92123, E-mail: sjones@merkelinc.com



KAISER, KIRSTIE L., Paseo de las Conchas Chinas #115 Depto. 4, Fracc. Conchas Chinas C.P. 48390, Puerto Vallarta, Jalisco, Mexico, 011-52 (322) 221 5041, FAX 011-52 (322) 221 5042, E-mail: kikaizer@pvnet.Com.Mx

KALOHL, KATHY & JOSEPH, 13901 Wilkie Ave., Gardena, CA 90249, (310) 719-1816, FAX (310) 538-3889, E-mail: wreckdiver77@yahoo.com

KANNER, PAUL, 10609 Esther Ave., Los Angeles, CA 90064, Phone (310) 559-7140, FAX (310) 559-9423, E-mail: pkann@comcast.net

KEMP, BRUCE & EMI, 9420D Carlton Oaks Dr., Santee, CA 92071, (619) 449-7610, FAX (619) 553-6391, E-mail: bkemp@spawar.navy.mil

KENNEDY, GEORGE, 8997 Moisan Way, La Mesa, CA 91941, (619) 667-1030, FAX (858) 679-9896(work), E-mail: gkennedy@bfsa-ca.com

KRONENBERG, GJIS C., Den Bult 98, NL-5616 GJ Eindhoven, the Netherlands, E-mail: gijsekro@worldonline.nl

LAGRANGE, JOHN & LINDA, 533 North Rios Ave., Solana Beach, CA 92075-1245, Phone/FAX (858) 755-7215, E-mail: lagrange@adne.com

LANCE, JAMES R., 3220 S. 8<sup>th</sup> St., Lebanon, OR 97355-1069, (541) 258-3709, E-mail: jlance@dswebnet.com

LEVIN, DEBRA J., 3100 Van Buren Blvd., Apt. 1117, Riverside, CA 92503-5623, (951) 354-7002 E-mail: levindj@att.net also lvndj@netscape.net

LIFF-GRIEFF, PHIL, 2447 Kemper Ave., La Crescenta, CA 91214, (818) 541-1232, E-mail: pliffgrieff@sbcglobal.net

LONHART, STEVE I., Monterey Bay National Marine Sanctuary, Sanctuary Integrated Monitoring Network (SIMON), 299 Foam St., Monterey, CA 93940, (831) 647-4222, E-mail: Steve.Lonhart@noaa.gov

LOVELL, LARRY, Benthic Invertebrate Collection, SIO/UCSD/Mail Stop 0244, 9500 Gilman Drive, La Jolla, CA 92093-0244, (858) 822-2818, (760) 945-1608 (home), FAX (858) 822-3310, E-mail: llovel@ucsd.edu

LUTHER, DOUG & MARY, 1535 Ipukula St., Honolulu, HI 96821-1419, (808) 377-5173, E-mail: dluther@soest.hawaii.edu

MARR, LAURETTA, 2646 Cherokee Rd. #9, Johnson City, TN 37604, (432) 926-9782, E-mail: RLMMID@aol.com

MCCLINCY, RICHARD J., 2332 W. Calle Ceja, Green Valley, AZ 85614, (520) 625-5697, E-mail: pmcclincy@att.net

MCLEAN, JAMES H., Malacology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007, (213) 763-3377, FAX (213) 746-2999, E-mail: jmclean@bcf.usc.edu

METZ, GEORGE E., 121 Wild Horse Valley Dr., Novato, CA 94947-3615, (415) 892-4960, E-mail: romageometz@earthlink.net

MICHEL, JOHN & NOLA, 4758 Mt. Cervin Dr., San Diego, CA 92117, Phone/FAX (858) 278-9088, E-mail: ejmco@san.rr.com

MOGOLLÓN, VALENTÍN, Roma 340, Lima 18, Perú, E-mail: svmogollon@yahoo.com

MULLINER, DAVID K. & MARGARET, 5283 Vickie Dr., San Diego, CA 92109, (858) 488-2701, E-mail: mulliner1@juno.com

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MYERS, JOHN & BARBARA W., 3761 Mt. Augustus Ave., San Diego, CA 92111, (858) 279-9806

NATURALIS, BIBLIOTHEEK, Postbus 9517, 2300 RA Leiden, The Netherlands

NELSON, LOIS, 7222 N. 15th Ave., Phoenix, AZ 85021-8658, (602) 347-9667

NORRIS, CHARLOTTE, 233 E. Cairo Dr., Tempe, AZ 85282-3607, (480) 967-4957, E-mail: charnorr2@aol.com

NORTHROP, MARILYN, 1528 Education Court, Lehigh Acres, FL 33971, (518) 383-6624, E-mail: mjohnthrop@worldnet.att.net

OREGON SOCIETY OF CONCHOLOGISTS, 7610 N.E. Earlwood Rd., Newberg, OR 97132, E-mail: wallens@earthlink.net

PASQUA, ROBERT A., 2236 Via Chalupa, San Clemente, CA 92673-3634, (949) 492-6855, E-mail: pasqua@cox.com,

PEÑA GONZÁLES, G. MARIO, Edificio Los Jazmines 206, Residencial San Felipe, Jesús María, Perú

PHILLIPS, JOHN, Abbey Specimen Shells, 214 Main St.#297, El Segundo, CA 90245, (310) 670-1155, FAX (310) 649-1131, E-mail: abbeyshells@msn.com

PHILLIPS, TONY, Hyperion Treatment Plant, Environmental Monitoring Division, 12000 Vista Del Mar, Playa del Rey, CA 90293, (714) 397-0014, E-mail: CUMACEA@Yahoo.com

PIERCE, KATHY, P.O. Box 1021, Wildomar, CA 92595, (909) 674-9370, E-mail: kathypierce\_realty@excite.com

PIERCE, ROSEMARY, P.O. Box 532, Wildomar, CA 92595-0532, (909) 609-9801

PISOR, DON & JEANNE, 10373 El Honcho Pl., San Diego, CA 92124, (858) 279-9342 (home), (619) 234-0249 (warehouse), FAX (619) 234-0250, E-mail: dpisor@earthlink.net

PISTER, BENJAMIN A., University of California, San Diego, 9500 Gilman Dr., Mail Code 0116, La Jolla, CA 92093-0116, (858) 453-7369, E-mail: bpister@ucsd.edu

POPPE, PHILIPPE, Conchology, Inc., Cebu Light Industrial Park, Basak, Lapu Lapu City, Cebu 6015, Philippines, +63 32 495 9990, FAX +63 32 495 9991, E-mail: carmelitaoy@conchology.be

POWELL, CHARLES L., Western Earth Surface Processes Team, U.S. Geological Survey, M/S 975, 345 Middlefield Rd., Menlo Park, CA 94025, E-Mail: cpowell@ucgs.gov

PRAS, STEPHANE, 15 Rue Marbeau, 75116 Paris, France, E-mail: stephane.pras@noos.fr

REITZ, CHARLES K., 410 Orpheus Ave., Leucadia, CA 92024, (760) 943-1029 (home), (760) 471-8657 (work), FAX (760) 471-6894

RICE, TOM, P.O. Box 219, Port Gamble, WA 98364, Phone/FAX (360) 297-2426, E-mail: Editor@ofSeaandShore.com

RITTER, WILLIAM J., 1005 Exchange Apt. 13, Astoria, OR 97103-0900, (503) 325-7948, E-mail: bulwinkl@pacifier.com

ROBERTS, DALE L. & KIMBERLY, 28402 Harvest View Lane, Trabuco Canyon, CA 92679, (949) 459-8886, FAX (949) 888-2786, E-mail: dale\_roberts@allergen.com

RUTKAS, TERRY, 13311 B Meyer Rd., Whittier, CA 90605, (562) 941-5439, E-mail: tjrutkas@verizon.net

SANTA BARBARA MUSEUM OF NATURAL HISTORY, Department of Invertebrate Zoology, 2559 Puesta del Sol Rd., Santa Barbara, CA 93105-2936, (805) 682-4711

SCHNEIDER, WILLIAM & NANCY, 12829 Carriage Rd., Poway, CA 92064-6045, Phone/FAX (858) 748-2822, E-mail: jtkcmom@sbcglobal.net and bajafisher@sbcglobal.net

SCHOENING, ROBERT C., 10607 Norman Ave., Fairfax, VA 22030-2928, (703) 273-9755, FAX (703) 352-7124, E-mail: rschoening@aol.com

SCRIPPS INSTITUTION OF OCEANOGRAPHY, SIO Library 0219, 9500 Gilman Drive, La Jolla, CA 92093-0219, (858) 534-1222

SENCKENBERGISCHE BIBLIOTHEEK, Zeitschriftenabteilung/DFG, Bockenheimer Landstr. 134-138, D-60325, Frankfurt am Main, Germany

SKOGLUND, CAROL, 3846 E. Highland Ave., Phoenix, AZ 85018, phone/FAX (602) 955-2072, E-mail: carolskoglund@msn.com

SMALL, MICHAEL, 12 Lambton Ave., Ottawa, Ontario K1M 0Z5, Canada, E-mail: msmall@wcfa.harvard.edu

SUNDERLAND, WALTER A., 7610 NE Earlwood Road, Newberg, OR 97132, (503) 625-6840, E-mail: wallens@earthlink.net

THE NATURAL HISTORY MUSEUM, Acquisitions Section, Dept. of Library & Information Services, Cromwell Rd., London SW7 5BD  
South Kensington, United Kingdom, E-mail: e.jamieson@nhm.ac.uk

TREGO, KENT D., 441 Ravina St. Apt. 3, La Jolla, CA 92037, (858) 456-7655, E-mail: nautilusoceanic@yahoo.com

UNDERWOOD, DORIS K., 698 Sheridan Woods Dr., West Melbourne, FL 32904, (321) 724-2449, E-mail: dunderwood1@cfl.rr.com

VALENTICH-SCOTT, PAUL, Santa Barbara Museum (NH), 2559 Puesta del Sol Rd., Santa Barbara, CA 93105, (805) 682-4711 ext. 146,  
FAX (805) 563-0574, E-mail: pvscott@sbnature2.org

VAWTER, DORIS, 3208 Bonita Mesa Rd., Bonita, CA 91902, (619) 479-7687, E-mail: vevawter@cox.net

VELARDE, RON, City of San Diego, EMTS Laboratory, 2392 Kincaid Rd., San Diego, CA 92101-0811, (619) 758-2331, 758-2350, E-mail:  
RVELARDE@SANDIEGO.GOV

VOLLERO, SILVANA & BOB PETROSKI, 5613 Carnegie St., San Diego, CA 92122, (858) 625-0756, E-mail: rpetrosk@san.rr.com

VON KRIEGLSTEIN, DOUG, 11288-A San Juan, Loma Linda, CA 92354, (909) 825-7207, FAX (909) 796-9658, E-mail:  
dougvon2002@yahoo.com

VOSO, ED, 1815-134 Sweetwater Rd., Spring Valley, CA 91977, (619) 469-8308

WATERS, CHARLES, 2703 Hutchison, Vista, CA 92084, (760) 941-2067

WEBER, GLADYS, 3607 Sylvan Meadows Court, Modesto, CA 95356-2011, (209) 549-1071, E-mail: gladweber@aol.com

WEBSTER, HERB & MELLA, 4403 Sierra Morena Ave., Carlsbad, CA 92008, (760) 730-3648, E-mail: mellamella@adelphia.net

WHITE, JACKIE, 886 Mountridge Ct., Las Vegas, NV 89110-2911, (702) 452-9651, FAX (702) 454-1268, E-mail: jcwhells@aol.com

JODY WOOLSEY, 3717 Bagley Ave. #206, Los Angeles, CA 90034-4148, (310) 839-1604, E-mail: maryjowo@mac.com or  
mjwoolsey@earthlink.net

WU, SHI-KUEI, Campus Box 265, MCOL Bldg, University of Colorado, Boulder, CO 80309-0265, Phone/FAX (303) 444-2306, E-mail:  
skwu@colorado.edu

WUYTS, JEAN, Koningsarendlaan 82, B-2100 Deurne, Belgium, E-mail: wuyts.jean@pi.be

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## PROGRAM

### Population of White Abalone off Southern California

Dr. John Butler of the National Marine Fisheries will give a PowerPoint presentation on the White Abalone *Haliotis sorenseni* and its current population in southern California. Much of the research was done with ROV.

Meeting date:17, 2005

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<i>Strombus granulatus</i> Swainson, 1822 (Gastropoda: Strombidae), a very variable species including a note on homonymy with <i>Strombus granulatus</i> Röding, 1798 (Gastropoda: Cerithiidae)	
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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting February 17, 2005

The meeting was called to order at 7:40 p.m. by President Jules Hertz. Introduced was a guest, Ed Ervin, whose interests lie in freshwater invertebrates and land snails. As it turns out, he was the lucky winner of the meeting's shell drawing. Minutes of the previous meeting were approved as published in *The Festivus*.

Carole Hertz announced particulars regarding the upcoming Annual Auction/ Potluck to be held on April 16<sup>th</sup> at Wes Farmer's condo complex.

Kelvin Barwick introduced the evening's speakers, UCLA Grad Student Todd Haney and Cheryl Brantley from the Los Angeles Sanitation District. Both are taxonomists and have been fortunate to be able to take part in scientific cruises aboard the U.S.Navy's R/V *Atlantis* with its deep-sea submersible, *Alvin*. Dr. Janet Voight of Chicago's Field Museum has been granted funds with which to survey the invertebrate biota and its environment around the underwater hydrothermal vents of the eastern Pacific. Two of the cruises were described and illustrated by computer projection. At the East Pacific Rise off Mexico at 8 degrees latitude, the audience became armchair scientists, sitting in a titanium sphere, retrieving octopi while using mechanical arms controlled by joysticks. Also observed, at the conjunction of tectonic plates, were lobster, crab, glass sponges, shrimp, anemones, jellies, amphipods, isopods, giant clams, limpets, scale worms and polychaetes, as well as unidentified gastropods.

Another chemosynthetic community of invertebrates, relying on hydrogen sulfide for nourishment, was pictured on DVD at the Gorda Ridge, twenty miles off the Oregon coast. It was a most interesting evening.

The meeting was adjourned at 9:15 p.m. Coffee-time followed, with refreshments by Wes Farmer and the Hertzses.

Nancy Schneider

### Too Late for the Roster

Cook, Bunnie & George, 1120 Makaiwa Street,

Honolulu, HI 96816, (808) 737-8050. E-mail: g.-b.cook@juno.com

Kosuge, Sadao, Institute of Malacology, 6-36 Midoricho 3 Chome, Nishi-tokyo City, Tokyo 188-0002, Japan, 81-424-63. E-mail:

I.MIT.Kosuge@excite.to.jp

Wise, John, Dept. of Malacology, Houston Museum of Natural History, One Hermann Circle Dr., Houston, TX 77030-1799, (713) 639-4677. E-mail: jwise@hmns.org

### The San Diego Shell Club's Annual Auction/Potluck

The Club's annual auction/potluck will be on Saturday evening April 16<sup>th</sup> in the community room of Wes Farmer's condo at 3591 Ruffin Rd., San Diego, CA 92123 (see map with directions, this issue). Festivities will begin at 5 p.m. with "Dave's Punch," wine, and soft drinks as you browse the auction tables. Dinner will be at 6 p.m. sharp and the voice auction will begin promptly at 7 p.m.

Among some very special items for auction are books and publications (some no longer in print) and also some exquisite pieces of coral. Among the many beautiful shells are a 91 mm specimen of *Conus pergrandis*, *Angaria sphaerula*, *A. poppei*, *Cypraea guttata*, *C. marginata*, *Cymbiola aulica malayensis*, *Teramachia smüthi*, *Siratus alabaster*, a huge *Cassis cornuta*, *Marchia laqueata*, and *M. elongata*. Besides the voice auction, there will be a great big silent auction and \$1 table.

This is the Club's only fundraiser and the biggest social event of the year. Your help is needed to make it a success. The annual auction provides the Club with the funds necessary to support its many activities such as *The Festivus*, Club library purchases, donations toward student grants, Greater San Diego Science Fair participation as well as the Club's social functions. If you have a donation, please contact auction chair Carole Hertz ahead of time at (858) 277-6259 so that your donations can be included on the auction list. Attendees are asked to bring either a main course, salad, or dessert to serve 12.

Most important of all – come to the auction and have a great time!!

*STROMBUS GRANULATUS* SWAINSON, 1822  
(GASTROPODA: STROMBIDAE), A VERY VARIABLE SPECIES,  
INCLUDING A NOTE ON HOMONYMY WITH *STROMBUS GRANULATUS*  
RÖDING, 1798 (GASTROPODA: CERITHIIDAE)

GIJS C. KRONENBERG

Milieu Educatie Centrum, P.O. Box 435, NL-5600 AK Eindhoven, the Netherlands  
E-mail: gijckro@worldonline.nl

and

HARRY G. LEE

Suite 500, 1801 Barrs Street, Jacksonville, FL-32204, USA  
E-mail: shells@HGLEE.com

Recently each author received specimens of a stromb which at first glance bore some resemblance to the well known *Strombus granulatus* Swainson, 1822. All three specimens, one being juvenile, came from a single lot, collected at Isla Sante Fe, Islas Galápagos (Figures 1, 2). They were taken in sand at 30 meters by a local lobster diver in June 2003. Although the two adult specimens differed somewhat from each other, they shared a number of characters which differed from typical *S. granulatus* from the American continent as we knew them from collections and literature. The differences were the relative height of the spire, number and size of the shoulder knobs, sculpture abapical of the shoulder knobs, color, size and density of the granules on the adcolumnellar side of the outer lip. This made us curious about the identity of the Galápagan shells, and we decided to pursue this matter further.

Subsequent contact with the suppliers of these shells, the brothers Coltro from São Paulo, Brazil, revealed that originally there had been five specimens, of which one was traced to the collection of Peter G. Stimpson, MD, Loudon, Tennessee, USA, who subsequently made photographs of his specimen available to us. In overall characters that specimen agreed with our specimens.

A further study of literature concerning the occurrence of *S. granulatus* based on a list of references provided by Dr. Yves Finet, Muséum d'Histoire Naturelle Genève, Switzerland, revealed that some

specimens from the Islas Galápagos much more closely resembled the typical form. Illustrations of specimens originating from the Islas Galápagos are rather scarce. It turned out, however, that the specimen illustrated by Reeve (1851, pl. 14, fig. 32a) originated from the Islas Galápagos (e-mail Kathie Way to GCK, 10 Oct. 2003). This specimen looks like a "normal" *S. granulatus*. Reeve (1851) in the explanation to his plate, mentioned Cuming as the source of his specimen. Since Cuming's records are not always reliable (see Dance, 1986), we felt more research was warranted.

Fortunately we were able to receive a number of specimens on loan from Kirstie L. Kaiser, Puerto Vallarta, Jalisco, México, and Lindsey T. Groves, Natural History Museum of Los Angeles County, California, USA. These samples (see material examined) enabled us to make a continuous series from our Islas Galápagos specimens to the typical form.

One specimen from the Kaiser collection from Isla del Coco (Figure 3), was aberrant in another fashion, notably the spire height and the size of the shoulder knobs (much shorter than in normal specimens), but again it was possible to make a series of transitional forms to the typical form.

Within the samples examined we found the number of knobs on the shoulder of the body whorl to vary from six to 12, with some possible correlation between size and number: the fewer knobs, the larger [i.e. more



spine-like] they tend to be. The rows of knobs abapically of the shoulder knobs varied from well developed to almost absent. The size of adults varied from 29.4 mm to 104.4 mm, the ratio of total height to height of body whorl varied from 1.75 to 1.37, granules at the adcolumnellar side of outer lip from very well developed to obsolete, and color ranged from almost uniformly pale (whitish) with occasional rather large, very pale brown blotches to numerous, small, very dark blotches. Some specimens had a pale lavender colored band on the shoulder of the body whorl.

Nevertheless, we are convinced that as songwriter Stephen Sills wrote, "there is something happening here, but what it is, ain't exactly clear." This will be discussed in another, more technical paper (Kronenberg & Lee, in prep.).

#### Abbreviations used

GCK: Gijs C. Kronenberg, private collection  
HGL: Harry G. Lee, private collection  
KLK: Kirstie L. Kaiser, private collection  
LACM: Natural History Museum of Los Angeles County

#### Material examined

MÉXICO: "West México", 1969, ex Jan Berkhout, GCK 5416/1; Guaymas, at 1.5 – 8 m in sand, GCK 501/1; Guaymas, dredged at 15 m, GCK 5417/1; Baja California Sur, Bahía Concepción, by diver, ex Jan Berkhout, GCK 5418/1; Mulegé, GCK 279/1; Nayarit, off Tres Mariás, long line fishing boat *Propemex* in nets at 70m, 199501-199502 KLK /1; COSTA RICA: Puntarenas, small islets off Quepos, 9°22.2'N, 84°09.3'W at 23 m, gravel & cobble, leg. J.H. McLean, R/V *Searcher*, 19720312, LACM 1972-59.4/7 very juvenile; Isla del Coco, off Bahía de Chatham, approx. 5°33'N, 87°02'W, in tangle net at 90 m, sand and crabs, 19910211, KLK 260/1; PANAMA: Isla Pedro Gonzáles, at 1.5 – 4 m in white sand, GCK 530/1; in sand at low tide, GCK 623/1; at 1.5 – 4 m, GCK 624/1; at low tide on rocks, GCK 625/1; Isla Cocos, by local diver, GCK 3451/1; Isla Cébaco, dredged at 33 m in sand, leg. J. Ernest, 199002, KLK /1; Archipiélago de las Perlas, Isla Caracoles, 8°30'N, 78°57'W, intertidal, alive in sand, 19850803, KLK 608/3; ECUADOR: Islas Galápagos: Isla Santa Cruz, Islas Plazas, M/V *Mistral*, night scuba dive 10 – 20 m, sand and light rubble 19880217, KLK 201961/6; Isla Santa Fé, in sand at 30 m by lobster diver, 200306, GCK 6268/1+1 juvenile,

HGL /1; Isla Española, off Bahía Gardner 1°21.9'S, 90°40.1'W, at 46 – 64 m, rock, leg. R/V *Velero III* 19340131, ex AHF201-34, LACM 34-75.4/7; Islas Gardner, M/V *Mistral* night scuba dive 10 – 15 m, sand with scattered rocks, 19880216, KLK 201960/1.

#### A Nomenclatorial Note

When reading through literature concerning the preparation of the paper mentioned above, we stumbled upon an earlier use of the name *Strombus granulatus*. Röding (1798) used *Strombus granulatus* [within his concept of *Strombus*, which differs from the modern use of the genus *Strombus*] prior to Swainson to denote a species now considered to be within the family Cerithiidae. Röding (1798: 98, sp. 1268) referred to Gmelin's *Murex granulatus* and to Martini 4, fig. 1483. Gmelin's name is no doubt a quotation of Linnaeus' earlier use (also as *Murex granulatus*, p. 756) of that name.

Houbrick (1978) in his extensive synonymy, when discussing *Rhinoclavis aspera* (Linnaeus, 1758), considered *Murex granulatus* Linnaeus, 1758, a junior synonym of *Murex asper* Linnaeus, 1758, but Houbrick (1978) did not mention Röding's name *Strombus granulatus* at all although he discussed the nomenclature of *Rhinoclavis aspera* extensively. To our knowledge the name *Strombus granulatus* Röding, 1798, has not been used as a valid name after 1899, and the use of the name *Strombus granulatus* Swainson, 1822, is consistent with the spirit of ICZN Article 23.2 and meets the requirements of Article 23.9.1.2. An appendix lists 27 references to the use of *Strombus granulatus* Swainson, 1822, as the presumed valid name for the species under consideration.

We invoke ICZN art. 23.9.1 to make the name *Strombus granulatus* Swainson, 1822, a *nomen protectum* and *Strombus granulatus* Röding, 1798, a *nomen oblitum*.

#### Acknowledgments

We thank José and Marcus Coltro for providing us with Galápagan specimens of *Strombus granulatus*; Dr. Yves Finet, Muséum d'Histoire Naturelle Genève, Switzerland, for providing a list of references to the occurrence of *S. granulatus* in the Galápagos; Lindsey T. Groves, Natural History Museum of Los Angeles County, California, USA, for the loan of specimens; K. L. Kaiser, Puerto Vallarta, Jalisco, México, for the loan of specimens; Han Raven, the Hague, The Netherlands,

for photography; Peter G. Stimpson, MD, Loudon, Tennessee, USA, for sending photographs of his Galápagos specimen of *S. granulatus*; Kathie Way, BMNH, London, United Kingdom, for information on specimens in her custody.

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**Figures 1-3.** *Strombus granulatus* Swainson, 1822 (**1 [top row]**) Ecuador, Islas Galápagos, Isla Santa Fé, in sand at 30 m by lobster diver, 200306, HGL. Actual height: 55.7 mm (**2 [middle row]**) Ecuador, Islas Galápagos, Isla Santa Fe, in sand at 30 m by lobster diver, 200306, GCK 6268. Actual height: 63.1 mm. (**3 [bottom row]**) Costa Rica, Isla del Coco, off Bahía de Chatham, appr. 5°33'N, 87°02'W, in tangle net at 90 m, sand and crabs, 19910211, KLK 260. Actual height 104.4 mm. →





## A RECORD SIZE FOR *MEGASTRAEA TURBANICA* (DALL, 1910) (GASTROPODA: TURBINIDAE)

KENT TREGO

441 Ravina Street, #3, La Jolla, California 92037, USA

E-mail: nautilusoceanic@yahoo.com

On February 17, 2004 an extremely large *Astraea* shell was collected in the kelp forest off Casa Beach in La Jolla, California. The shell was dead collected by Ed Kisfaludy of Scripps Institution of Oceanography while scuba diving in 55 feet of water. The species was identified by Larry Lovell of the Benthic Invertebrate Collection of Scripps Institution of Oceanography as *Megastrea turbanica* (Dall, 1910). The specimen was cataloged into the Benthic Invertebrate Collection as Lot number M11378

The shell is 185.5 mm in height. The dorsal side of the shell showing the last whorl is shown in Figure 1. The current world record for *M. turbanica* is listed by Hutsell, Hutsell & Pisor (2001) as 170 mm in height. Therefore, this *M. turbanica* is the new world record for the species. Myers (1989) discusses the range of this species.

### ACKNOWLEDGMENTS

My thanks to Larry Lovell of the Benthic Invertebrate Collection at Scripps Institution of Oceanography for his assistance in the preparation of this note.

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1989. *Astraea (Megastrea) turbanica* found in coastal waters  
at San Diego, California. The Festivus 21(3): 22-25, 8  
figs.



Figure 1. *Megastrea turbanica*, dorsal view of 185.5 mm specimen.  
Photo: William Newman of Scripps Institution of Oceanography.



# THE FESTIVUS

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## PROGRAM

Come to the Auction/Potluck  
Saturday April 16<sup>th</sup> at 5 p.m. at Wes Farmer's Clubhouse  
There is no regular meeting this month.  
[See information in the March issue of *The Festivus*.]

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting March 17, 2005

The meeting was called to order by President Jules Hertz at 7:40 p.m. Minutes from the previous meeting were approved as published in *The Festivus*.

Carole Hertz reminded those present about the importance of the upcoming Annual Auction on April 16<sup>th</sup> at 5 p.m., to be hosted by Wes Farmer at his condo complex. The Voice Auction will feature a large number of books as well as shells and shell-related materials. In addition there will be a Silent Auction and \$1 Table. A potluck dinner will precede the affair, which supports activities of this organization.

John LaGrange, along with Carole Hertz and Terry Arnold, judged the Science Fair last week. The Club winner was a student project on parthenogenesis of sea urchins.

Jules announced that The Butcher Shop has again been reserved for the Club Christmas Party on December 3rd.

John LaGrange introduced the evening's speaker, Dr. John Butler, who presented a PowerPoint program on Rebuilding California's Abalone Stocks. John works as a fishery biologist at the National Fisheries Center in La Jolla and his interest is in population dynamics. He explained that all abalone species in southern California are in decline after being highly fished during the 1960s to 1980s. Commercial fishing for abalone has been closed since 1997. However, in northern California, stocks are sufficient for free-diving with a limit of two per day. Black abalone started dying in the 1980s from a heat-sensitive pathogen causing a "withering foot syndrome" and are now being considered for endangered status. White abalone is a deeper occurring species, growing on rocks, commonly between 40 and 50 meters and ranging from Point Conception to Cedros Island. Its flesh is better tasting and may be sliced without being pounded. But only 1% of their previous numbers are now living. Much of their natural history, such as longevity, is unknown. Will reproduction in the wild be successful with densities so low? It is now listed as an endangered species.

After his program, John fielded many questions from an interested audience. Adjournment came at 8:40 p.m. St. Patrick's Day cookies were provided by Silvana Vollero; homemade nut cookies came from bakers John LaGrange and Wes Farmer.

### Too Late for the Roster

Defoort, Sabine, Boekhandel Justus Lipsius, BVBA  
Belgicalaan 35, 1080 Brussels, Belgium. Phone:  
32 2 425 05 20, FAX: 32 2 425 50 33. E-mail:  
bookstore.justuslipsius@plnetinternet.be

Whitman, Charles, 45 East End Ave, (10A), New  
York, NY 10028. Phone: 212-861-8211. E-mail:  
chwhit@nyc.rr.com

### Change of e-mail

Small, Michael, <michaelsmall@sympatico.CA>

### Donations to the Club Library

Members John Jackson and Bruce Kemp have both donated books to the Club's circulating library this month.

John has presented the Club library with two books. The first, the soft-covered *Reef Fish Identification - Baja to Panama*, is a beautiful new book by Paul Humann and Ned DeLoach (2004) which will be a "must" for those who are fascinated by the underwater life in the Panamic. It has more than 500 color photographs of 400 species taken in their natural habitat. The second book, *Soft Corals and Sea Fans, a Comprehensive Guide to the Tropical Shallow water Genera of the Central West Pacific, Indian Ocean and the Red Sea*, is a beautifully illustrated volume by Katherina Fabricius and Philip Alderslade published in 2001 by the Australian Institute of Marine Science. This soft-covered book of 264 pages has over 700 exquisite color photographs and identifies over 90 genera of soft corals and sea fans.

Bruce Kemp has donated the well-known book *Conchs, tibias and harps* by J.G. Walls, published in 1980 which will also be a new addition to the Club library. The Strombidae enthusiast will find many beautiful color photographs of their favorite species.

The Club thanks them both for their generosity.

**TELLINA INAEQUISTRIATA DONOVAN, 1802:  
A DOUBLE NEOTYPE DESIGNATION TO STABILIZE NOMENCLATURE**

EUGENE V. COAN & PAUL VALENTICH-SCOTT

Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road, Santa Barbara, California 93105-2936, USA  
gene.coan@sierraclub.org, pvscott@sbnature2.org

A small, colorful and distinctive tellinid bivalve of the Panamic Province, *Tellina* (*Eurytellina*) *inaequistriata* Donovan, 1802 (pl. 123) (Figure 1), rests on a most unstable nomenclatural foundation.

This species was described, in error, from Dorsetshire, England, having been found by Richard Pulteney, who presented it to Emanuel Mendez Da Costa. No type specimen is extant in The Natural History Museum in London, and this material is unlikely to be in other collections in the United Kingdom (J. Taylor, e-mail, 4 June 2004).

Having seen a similar species among Cuming's South American material, Hanley (1846: 238, pl. 57, fig. 58; pl. 58, fig. 80) attributed the species to Guayaquil, Ecuador. However, it is rather improbable that Donovan had a relatively uncommon, small eastern Pacific tellinid in hand when he described *Tellina inaequistriata*. Given that very early date, it is more likely that Donovan based his description on a specimen of the western Atlantic *T. (E.) nitens* C. B. Adams, 1845 (p. 10) [holotype: MCZ 155606], which was described from Jamaica and has been regarded as the closest relation to the eastern Pacific taxon (Boss, 1968: 288-293). Indeed, Dautzenberg (1900: 260) reported *T. inaequistriata* from the western Atlantic.

While it seems more likely that the original material of *Tellina inaequistriata* came from the western Atlantic, it would not be in the interest of nomenclatural stability to fix it as such, because it would result in changing long-standing names in two oceans. We, therefore, herein designate as **neotype** of *T. inaequistriata* Donovan, 1802, the following specimen and provide an expanded description and distributional information.

SBMNH 125650, a pair of matched valves (Figure 2), neotype of *Tellina inaequistriata*

Donovan, 1802; length, 28.9 mm; height, 15.7 mm; width, 6.6 mm. The **neotype** is from Manzanillo, Colima, México (19.1°N, 104.3°W); collected by Fred E. Lewis. The remainder of this lot (3 specimens) has been catalogued as SBMNH 354565.

**Description:** Shell ovate-elongate, compressed; subequilateral; posterior end truncate; periostracum thin, somewhat deliscent, iridescent, dark yellow; external color rose, with lighter yellow commarginal bands (Figure 2a); umbones with white radial ray (Figure 2e); sculpture on right valve of very low, broad irregular commarginal ribs grading into a few well-spaced commarginal lamellae on posterior slope (Figure 2c), frequently with a smooth region between the two sculptural areas; sculpture of left valve similar to right, but without posterior lamellae; inner ventral margin finely crenulate, most prominent anteriorly (Figures 2b, d); with a conspicuous, raised internal strengthening rib just posterior to anterior adductor muscle scar (Figure 2b); right valve with a moderately distant anterior lateral tooth and a distant posterior lateral tooth; pallial sinuses closely approaching but not reaching anterior adductor scars; shell length to 40 mm.

**Distribution:** From near the head of the Golfo de California at Bahía La Cholla (Choya), Sonora, México (31.4°N) [Skoglund Collection], to the Golfo de Guayaquil, Guayas, Ecuador (3.1°S) (Olsson, 1961: 396); 18-33 m. It is also present in the Pleistocene of Panamá [PRI 25883, *vide* Olsson, 1961].

**Comparison:** The eastern Pacific *T. inaequistriata* differs from the western Atlantic *T. nitens* in having stronger sculpture on its posterior slope, finer

commarginal sculpture, and crenulate anterior and ventral margins internally (Boss, 1968: 292).

### Discussion

Keen (1971: 217) concluded that *Tellina gemma* Gould, 1853 (p. 399, pl. 16, fig. 5) (Figure 3), was a synonym of *T. inaequistriata*. Gould's material was collected by Lieutenant T. P. Green at "San Juan". Johnson (1964: 82) incorrectly concluded that Gould's San Juan was in southern California. However, Gould (1853: 374) specifies that the San Juan involved is at 27°N on the gulf side of Baja California near the present-day city of Mulegé, Baja California Sur. No San Juan appears in current gazetteers covering that area; it may have been a local ranch at the time. The original figure shows a pair of closed valves, and the description does not provide sufficient characters to be certain which of several species Gould may have had. This species also has a fairly early date, and its use in any other sense could jeopardize other established names. No type material of this species has come to light (Johnson, 1964). It has not been located at the Academy of Natural Sciences, Philadelphia (P. Callomon, e-mail 8 September 2004), the Museum of Comparative Zoology, Harvard (A. Baldinger, e-mail 8 September 2004), nor the National Museum of Natural History (T. Nickens, e-mail 8 September 2004). Therefore, in the interest of nomenclatural stability, the specimen above (SBMNH 125650) is also herein designated **neotype** of *Tellina gemma* Gould.

*Tellina leucogonia* Dall, 1900 (p. 317, pl. 4, fig. 5) (USNM 102182) is an additional synonym. Hertlein & Strong (1949: 74-75) concluded that Dall's species, described from the Golfo de California, was the same as *T. inaequistriata*, and we agree. The type lot consists of three syntypes, the largest of which is 34.3 mm in

length, and it is figured here (Figure 4). Finally, *Tellina (Eurytellina) mantaensis* Pilsbry & Olsson, 1943 (p. 80, pl. 8, figs. 1-4), is another synonym. This species was, as the name implies, described from Manta, Manabí, Ecuador (ANSP 178904). The holotype is 31.1 mm in length and is also figured here (Figure 5).

A final complication is that Hanley (1846: 238), followed by Hertlein & Strong (1949: 74), listed *Tellina sanguinea* Wood, 1815 (p. 159, pl. 44, fig. 2), as a possible synonym, the presumption being that it also came from Ecuador. However, the original figure of that species (Figure 6) has an altogether different shape and color pattern and is not *T. inaequistriata*. We are not aware if this species has been assigned to some other province, but it is unlikely to have been from the eastern Pacific Ocean.

### Acknowledgments

We gratefully thank the following individuals for checking their collections and lending type and/or comparative material for this project, John Taylor and Kathie Way (BMNH), Paul Callomon (ANSP), Adam Baldinger (MCZ), Tyjuana Nickens (USNM) and Carol Skoglund.

### Abbreviations

ANSP – Academy of Natural Sciences, Philadelphia, USA

BMNH – The Natural History Museum, London, UK

MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, USA

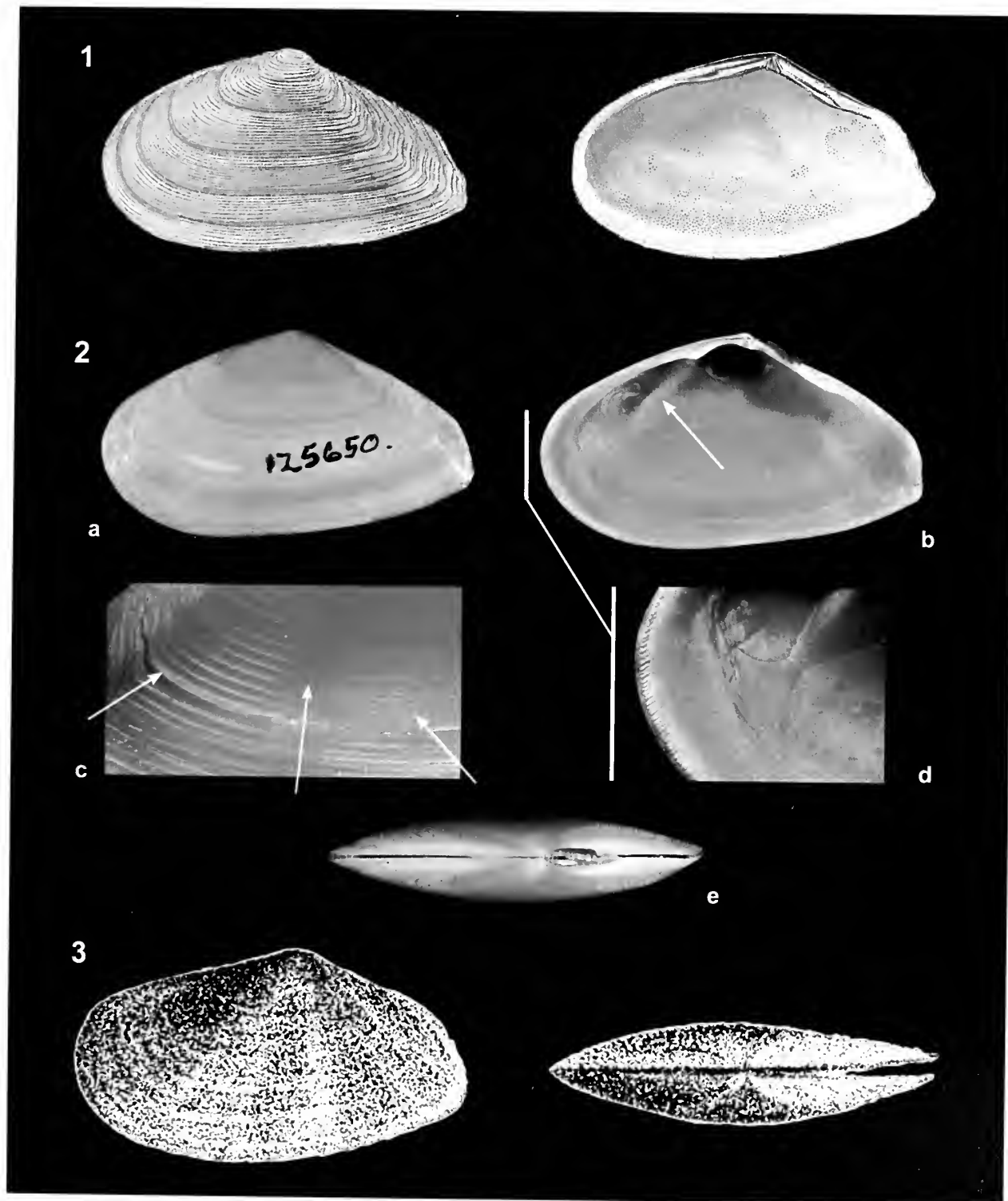
SBMNH – Santa Barbara Museum of Natural History, California, USA

USNM – National Museum of Natural History, Washington, D.C., USA

**Figures 1-3.** (1) Original drawing of *Tellina inaequistriata* from Donovan, 1802 (plate 123). (2) **Neotype** of *Tellina inaequistriata* Donovan, 1802, and of *T. gemma* Gould, 1853 (SBMNH 125650), length 28.9 mm: (2a) exterior left valve (2b) interior right valve arrow indicating internal strengthening rib (2c) magnified view of posterior of exterior right valve with commarginal lamellae (left arrow), smooth medial region (center arrow) and fine irregular commarginal ribs (right arrow) (2d) magnified view of anterior region of interior right valve showing marginal crenulations (2e) dorsal view show white stripe on umbones. (3) Original drawing of *Tellina gemma* from Gould, 1853 (plate 16, figure 5).

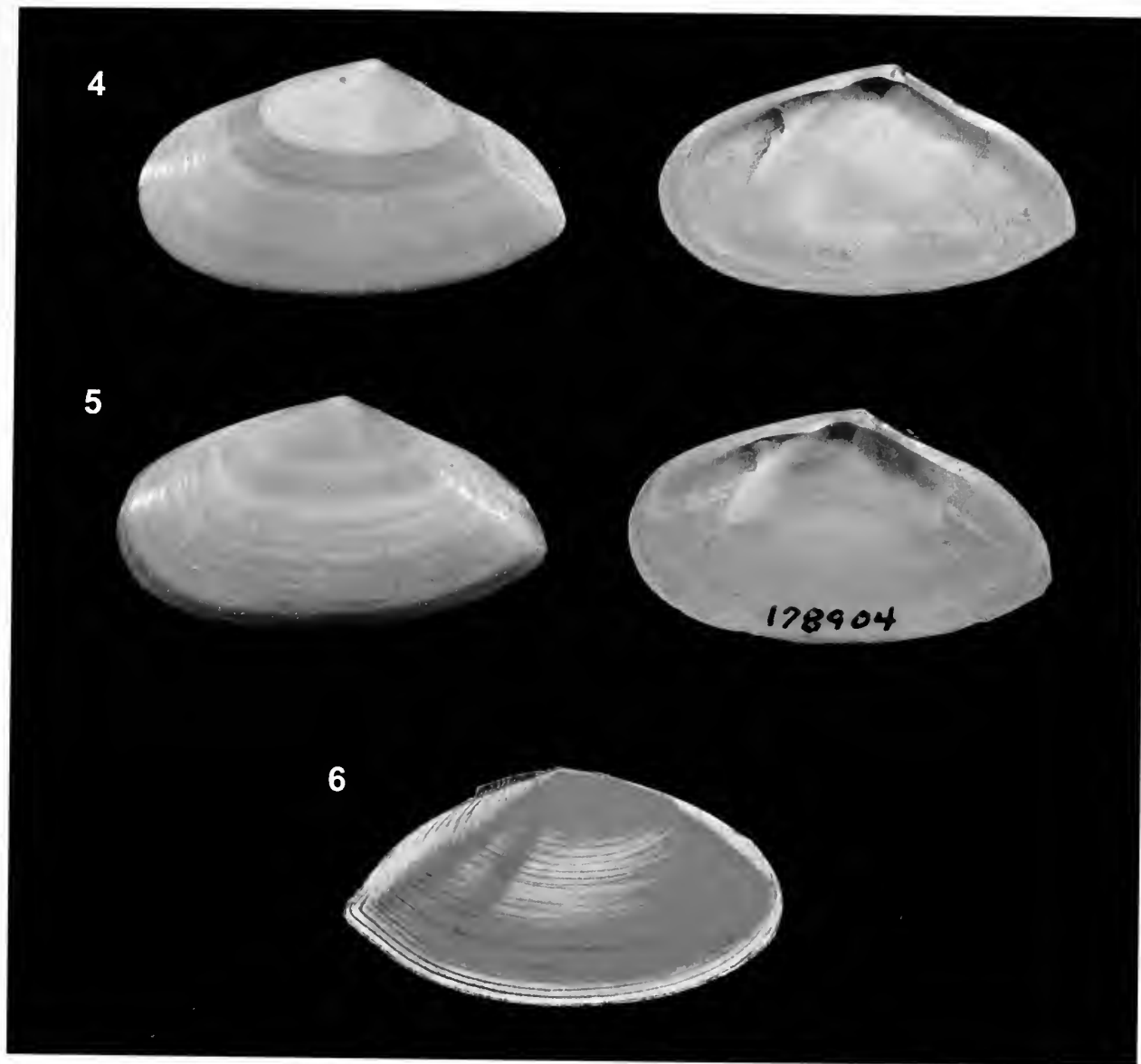
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**Figures 4-6.** (4) *Tellina leucogonia* Dall, 1900, syntype, USNM 102182, length 34.3 mm (5) *Tellina* (*Eurytellina*) *mantaensis* Pilsbry & Olsson, 1943, holotype, ANSP 178904, length 31.1 mm (6) Original drawing of *Tellina sanguinea* from Wood, 1815 (plate 44, figure 2).



## A TRIP TO A LOCAL SAN DIEGO BEACH

JULES HERTZ

Santa Barbara Museum of Natural History, Department of Invertebrate Zoology  
2559 Puesta del Sol Road, Santa Barbara, California 93105-2936, USA  
E-mail: cmhertz@pacbell.net

From 1966 until the mid 1990s, the Hertzes actively collected seashells at the local San Diego beaches. In the past few years our occasional visits to the beach have been to show our grandchildren and other relatives the tide pools and the various animals that live there. In the early years, one of our favorite collecting spots was in Mission Bay at Crown Point. This beach then had many bivalve species that lived in the mud and eel grass and we often went there to collect *Chiones* which we would steam in wine for a great weekend appetizer. They were very abundant in those years. In addition there were numerous gastropods at the base of bridge pilings which are no longer there. Of course as the Bay became more polluted we no longer would eat the bivalves which lived there.

We found a great variety of bivalves there in the past, with the least common species being *Trachycardium quadragenarium* (Conrad, 1837) and *Argopecten ventricosus* (G.B. Sowerby II, 1842) (formerly called *aequisulcatus* Carpenter, 1864). The latter is a protected species, and in over 30 years we had only seen about 10 at this beach. The most common gastropods there had been *Bulla gouldiana* Pilsbry, 1893, nassarids, muricids, and moon snails, primarily *Polinices reclusianus* (Deshayes, 1839). Only once did we find *Polinices lewisii* (Gould, 1847) at that location.

On Sunday, 13 December 2004, we decided to visit Crown Point to see if it was still as we remembered. We hadn't been there for about five years and there was a minus 1.7 ft. tide in the late afternoon. The beach was deserted except for a large number of shore birds including herons, gulls, willets and skimmers. Things had definitely changed including a beautifully paved walkway around the entire beach. It was a beautiful day and it was fun slogging around in the mud. The most surprising change was that *Argoecten ventricosus*

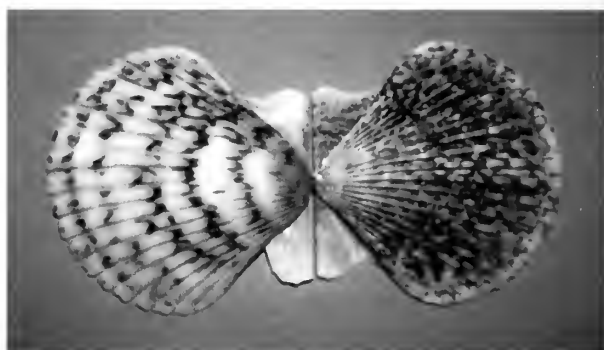


Figure 1. *Argopecten ventricosus*, 45.5 mm H, collected empty.  
Photo: S. Parlett.

was everywhere along the entire beach. We saw approximately 100 live specimens and many hundreds freshly eaten. It looked like it was a favorite treat for the birds, since even along the paved walk there were numerous dropped and broken specimens. We saw a few live *Chiones* and only a few empty shells. We saw three dead *Trachycardium quadragenarium* but no live specimens. *Bulla gouldiana* was everywhere but we saw no nassarids or moon snails, however, we did see some old moon snail collars. Among the live gastropod species we saw were *Pteropurpura festiva* (Hinds, 1844), *Roperia poulsoni* (Carpenter, 1864), *Tegula funebris* A. Adams, 1865, *Megastrea undosa* (Wood, 1828) and *Navanax inermis* (Cooper, 1863).

We were thrilled to find so many species still living at the beach. There were patches of yellow sponge among the rocks, sea squirts and we even saw a live sand dollar. Mussels and oysters are still there but only occasional specimens. It was a fun day, particularly since all the tourists had gone.

## THREE STUDENT GRANTS OFFERED

**The Western Society of Malacologists, the Southwestern Malacological Society, the San Diego Shell Club, and the Northern California Malacozoological Club** announce the availability of grants to support student research in malacology. Funds are available for actual research costs, including but not limited to, field and laboratory equipment, chemicals, photographic supplies, computer time and supplies, microscope usage fees, and reasonable research travel costs.

Applicant must be a full-time student in a formal graduate or undergraduate degree program. There are no citizenship or affiliation restrictions and students from all countries are eligible.

The thesis, dissertation, or research project must be focused primarily on the systematics, biology, ecology, physiology, biochemistry, or paleontology of marine, terrestrial or freshwater mollusks. Research currently in progress or beginning in the 2004-2005 academic year will be considered.

Cover application page with the following information: proposal title, applicant name, addresses, contact numbers, etc, including a listing of no more than five keywords that describe the proposed research.

The proposal, limited to two pages, which discusses the research project and its malacological significance including details of the work to be aided by this grant.

A budget which outlines how the grant funds will be used. A resume or outline of the applicant's academic background. A letter of recommendation from the applicant's research advisor (must be transmitted or mailed separately by advisor). A list of grants and amounts that are currently being received or have been applied for in the 2004-2005 academic year. Awards of up to \$1000.00 US are available.

For further information, please go to <http://biology.fullerton.edu/orgs/wsm/grants.html> for links to download MS Word, RTF, or pdf versions of the official Application Form. Applications can be submitted either as attached WORD documents or in PDF format. Completed applications must be received no later than 1 May 2005. For further information contact: Lindsey T. Groves at (213) 763-3376 (voice); (213) 746-2999 (fax); e-mail: [lgroves@nhm.org](mailto:lgroves@nhm.org) or send to Natural History Museum of Los Angeles County Malacology Section, Collection Manager 900 Exposition Blvd., Los Angeles, CA 90007, USA.

**The Houston Museum of Natural Science and the Houston Conchology Society** invite applications for the 2005 Constance Boone Grant to Malacology. As always, awards will be made only to citizens or permanent residents of the Americas (i.e., North, Central and South America), particularly to undergraduate and graduate students.

For requirements and instructions go to <http://www.houstonshellclub.com/Grants.htm>. John B. Wise, Ph.D. Curator of Malacology, [jwise@hmns.org](mailto:jwise@hmns.org) (713) 639-4677, Fax (713) 639-4767, the Houston Museum of Natural Science, One Hermann Circle Drive, Houston, TX 77030-1799.

**Unitas Malacologica Student Research Award for 2005** offers two grants, each of up to €000, every year to students engaged in research projects of a malacological nature. These will generally be projects undertaken in pursuit of higher academic degrees (e.g. M.Sc. and Ph.D.). Normal budget items include supplies, expendable equipment and research-related travel. The awards cannot be used to cover salaries, institutional overheads, permanent equipment or conferences. There is no official application form.

Applications must not exceed six pages and should include: 1) title of project; 2) summary of project not exceeding 150 words; 3) the body of the proposal including background information necessary to understand the project and its significance, materials and methods, and proposed plan of research; 4) itemized budget of estimated expenses; 5) literature cited; 6) a one-page personal résumé including addresses, etc.

Applications from students who are not members of UM or an affiliated organization will be accepted, but must be accompanied by a letter of recommendation by a nominator who is a member in good standing. The next deadline for submissions is 31st May 2005.

Applications should be sent, preferably as an e-mail attachment, to the secretary: Dr Dai Herbert, Secretary: Unitas Malacologica, Natal Museum, P. Bag 9070, Pietermaritzburg 3200, South Africa. E-mail: [dherbert@nmsa.org.za](mailto:dherbert@nmsa.org.za). Tel. +27(0)33 3451404; Fax +27 (0)33 3450561, Dr D.G. Herbert, Department of Mollusca: Head, Natal Museum, P. Bag 9070, Pietermaritzburg, 3200, South Africa. **Natal Museum website:-** <http://www.nmsa.org.za>

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American Museum of Natural  
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Address all correspondence to the San Diego Shell Club, Inc.,  
c/o 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA.

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Meeting date: third Thursday, 7:30 PM,  
Room 104, Casa Del Prado, Balboa Park, San Diego

Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### Southern California Shells and Shelling

Paul Kanner, member of both the Pacific Conchological Club and the San Diego Shell Club will give a program on our southern California molluscan fauna with comments on keeping local specimens in an aquarium.

and

Science Fair winner Evan Morikawa will give an overview of his winning project on parthenogenesis in sea urchins.

Meeting date: May 19, 2005

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## CLUB NEWS

### The Auction/Potluck – 2005

Wasn't it a time!! Over 40 people attended the Club's annual auction/potluck and what fun they had. At 5 p.m. Bill Romer had "Dave's Punch" mixed and ready, and wine (donated by John Jackson) and soft drinks were available. Members and guests arrived to visit with each other and enjoy and browse the auction tables. At 6 p.m. the dinner buffet was ready and members outdid themselves donating delicious appetizers, entrees, salads and desserts. There was more than enough tasty food to satisfy our hungry group.

Promptly at 7 p.m., auctioneer Carole Hertz announced the rules for the auction and the bidding began with a perfect specimen of *Siratus alabaster*. The shells on auction were of fine quality and Carole joked, prodded and cajoled to get the bids going. The heaviest bidding of the evening was probably for a perfect specimen of the rare *Haliotis roberti*. But one unusual entry was great fun. Longtime member Ed Voso donated a sealed mystery "shell" for the auction, with an attached note stating that the item was guaranteed to be worth \$25. At first hesitantly, the bidding went up to \$20 and Mella Webster found out that the shell she'd bought was a check for \$25! The audience greatly appreciated and applauded Ed Voso for his original, fun donation.

Many people are to be thanked for the successful auction – besides those who bid and bought. First, Wes Farmer for once again hosting this annual event. Then the Club board that worked tirelessly sorting and readying the many items for the voice and silent auctions. And, as always, the members who pitched in for the cleanup at the end.

But without the donations of shells and related items there could have been no auction. Following are listed those who donated to this event. Terry Arnold, Marty Beals, Larry Catarius, Twila & Tom Critchlow, Henry Chaney, Wes Farmer, Billee Gerrodette, Carole & Jules Hertz, John Jackson, Anne Joffe, Kirstie Kaiser, Paul Kanner, John LaGrange, Ray McKinsey, John Phillips, Rosemary & Kathy Pierce, Don & Jeanne Pisor, Philippe Poppe, Bill & Nancy Schneider, Carol Skoglund, Bobbie Stephenson, Gerhard Venken, Ed Voso, Gladys Weber and George Zorilla.

### Additions to the Roster –2005

Museum National Histoire Naturelle, Bibliotheque de Malacologie, CP 51, 57 Rue Cuvier, 75231 Paris (EDE) 05, France

Negus, Rick and Sheryl, 3401 Wwoodland Way, Carlsbad, CA 92008. Ph: 760-434-9808. E-mail: rnegus@adelphia.net

Romer, Bill and Carol, 3249 Towser, San Diego, CA 92123. Ph: 858-278-2349. E-mail: wromer1@san.rr.com

Smithsonian Institution Libraries, NHB 25 MRC154, P.O. Box 37012, Washington, D.C. 20013-7012

### "2,400 Years of Malacology"

by: Eugene V. Coan, Alan R. Kabat & Richard E. Petit (2005, second edition),

"This publication is a comprehensive catalog of biographical and bibliographical papers on malacologists, conchologists, paleontologists, and others with an interest in mollusks.

Since the first edition was posted, in June 2004, we have received comments and additions from a number of colleagues -- for which we are most grateful -- and we have continued our own searching through the extensive literature.

Among the biographical references that are included for the first time in the second edition are: Oxford Dictionary of National Biography (2004); M.R. Carriker (2004), Taming of the Oyster: A History of Evolving Shellfisheries and the National Shellfisheries Association; D.M. Damkaer (2002), The Copepodologist's Cabinet: a Biographical and Bibliographical History; and R.V. Egorov (2004), Directory of Malacologists and Conchologists of the CIS and Adjacent Countries (formerly the USSR). This catalog is a work in progress, and we will be posting updated versions periodically. We encourage readers to explore and use this catalog, and we look forward to receiving your comments.

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# ANACHIS PACHYDERMA CARPENTER, 1857, A VALID PANAMIC PROVINCE SPECIES (COLUMBELLIDAE: GASTROPODA)

CAROL SKOGLUND<sup>1</sup>

Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road, Santa Barbara, California, 93105-2936, USA  
E-mail: carolskoglund@msn.com

## Introduction

*Anachis pachyderma* Carpenter, 1857 (Figures 1, 3), is here considered to be a valid species, and not a synonym of *Anachis scalarina* (Sowerby, 1832) (Figures 2, 4) as indicated by Keen (1968, 1971). The late Dr. George Radwin of the San Diego Natural History Museum, an authority on the Columbelloidea, first identified my material as *A. pachyderma*, but did not publish on it. This study confirms his findings.

## Material studied

The collections of the Santa Barbara Museum of Natural History (SBMNH); Kirstie L. Kaiser, Puerto Vallarta, México (KLK); Jules and Carole Hertz, San Diego, California (JCH); and Carol Skoglund, Phoenix, Arizona (CS), were studied. I have seen 48 lots with over 300 specimens of *A. pachyderma*, and 12 lots with 69 specimens of *A. scalarina*.

## Systematics

Family Columbellidae

Genus *Anachis* H. & A. Adams, 1853

*Anachis pachyderma* Carpenter, 1857

1857. *Anachis* (? *costellata*, var.) *pachyderma* Carpenter, 1857: 507, no. 646.

1958. As a synonym of *Anachis costellata* (Broderip &

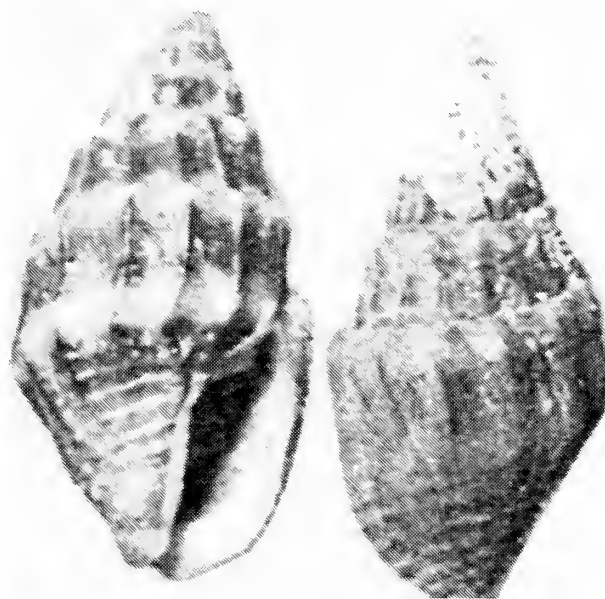


Figure 1. *Anachis pachyderma* Carpenter, 1857. Two syntypes, largest 16 mm (BMNH 1857.6.4.2422). Habitat: Mazatlán, rare. After Keen, 1968.

Sowerby, 1832) (Keen: 1958: 380, fig. 425).

1968. *Anachis* ?*costellata*, var. *pachyderma* ? = *Anachis scalarina* (Sowerby, 1832) (Keen: 1968: 426, pl. 59, figs. 83a-b).

1971 As a synonym of *Anachis* (*Anachis*) *scalarina* (Sowerby, 1832) (Keen: 1971: 77, fig. 1171, pars).

<sup>1</sup> Mailing address: 3846 E. Highland Avenue, Phoenix, AZ 85801, USA.



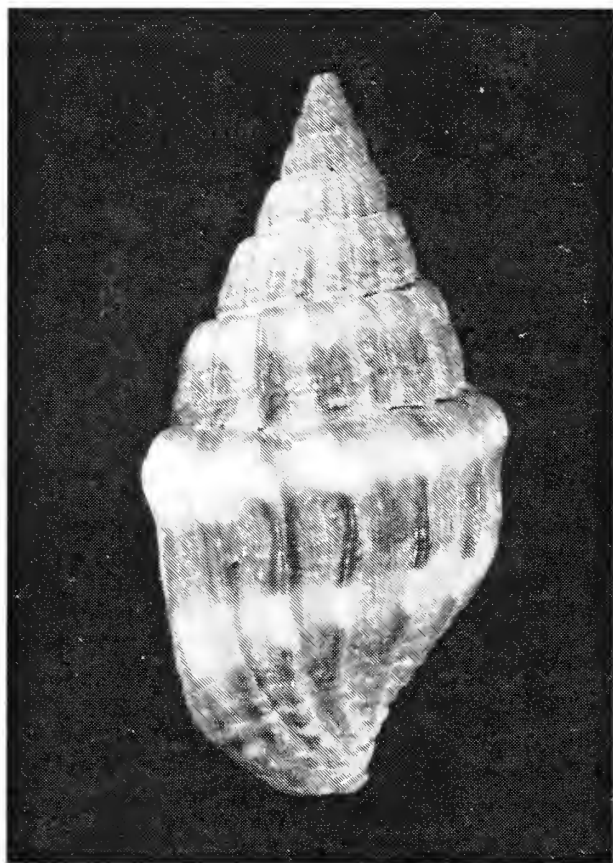


Figure 2. *Anachis scalarina* Sowerby, 1832, dorsal view of syntype, 21.6 mm (BMNH 1966316). Type locality: Panamá, under stones, H. Cuming Collection. Published with the kind permission of the Trustees of the British Museum (Natural History). Original photo courtesy of the late George E. Radwin.

Carpenter (1857) named *Anachis pachyderma* as a possible variety of *A. costellata* (Broderip & Sowerby, 1829). He noted, "It might be said that the true *A. costellata* is this shell with the outer part of the epidermis rubbed off; but in this form, when the epidermis comes off, it leaves the dark purplish brown surface of the shell itself, not the close thin skin of the chestnut-stained *A. costellata*." *Anachis costellata* does have the tabulate spire of the genus *Anachis*, but shells identified by Radwin as that species have two small, smooth, nuclear whorls followed by a third much enlarged whorl. The first postnuclear whorl is characterized by protractive axial ribs, not found on *A. pachyderma*. Brann (1966, pl. 56:507-508) figured the operculum of *A. pachyderma* from Carpenter's tablet 2423.

Keen (1958) indicated the name *Columbella pachydermata* as a possible synonym of *A. costellata*.

After a trip to the National Museum of Natural History, London (BMNH) to study the Carpenter types, Keen (1968) thought that *A. pachyderma* might be a possible synonym of *A. scalarina*. The two Carpenter syntypes of *A. pachyderma* figured by her (pl. 59, figs. 83a-b) (Figure 1 herein) are examples of what I now propose as a valid species.

In 1971 Keen listed *A. pachyderma* as a synonym of *A. scalarina* with a distribution from Mazatlán, Sinaloa, México, to Panamá. She added that *A. pachyderma* might prove to be a separate, more northern species. Five shells were figured by her as *A. scalarina* on page 579, figure 1171. The two on the left are of the same Carpenter syntypes of *A. pachyderma* from the BMNH that Keen figured in her 1968 paper. The two on the right are *A. scalarina* from Panamá, then in the Stanford University Collection. The center shell is from Pilsbry and Lowe (1932: 71, pl. 5, fig. 1), as *A. gilva* Menke, 1846, and appears to be neither of the above species. Radwin (1977) figured *Anachis scalarina* as the type of the genus *Anachis*, but unfortunately the legend for his figure 24 was *Parvanachis isabellei*. The text is correct and the shell figured is actually *A. scalarina*.

### Discussion

Although the shells of the two species are similar, there are several important differences between *A. pachyderma* and *A. scalarina* (Table I).

*Anachis pachyderma*, originally described from Mazatlán, is a usually straight-sided, glossy, purple brown shell with a purple-brown aperture in fresh specimens. These colors fade to brown with time. The outer lip varies from dentate to smooth. In some specimens the ends of the ribs appear under the parietal callus as bumps. The shape of the anal groove in the two species is very different. The apically directed groove in *A. pachyderma* has a slight white swelling on the columellar side but is otherwise smooth. The outer lip has a slight indentation just below the anal groove. The largest specimen seen is 19.4 x 9.0 mm.

The *A. pachyderma* from the northern part of the range (Figure 3) lack periostracum and protoconchs in most adult shells. Juveniles sometimes have these features. In the southern part of the range the protoconch, while still uncommon, can be found occasionally in adults. The periostracum, which is completely missing to just a few shreds in the northern part of the range, is apt to be heavier in the southern part of the range but never the heavy one usually seen on *A. scalarina*. Could this lack of periostracum and

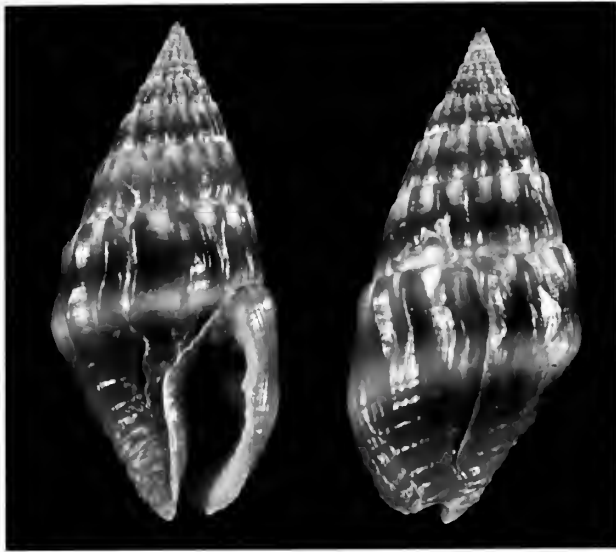


Figure 3. *Anachis pachyderma*, length 17.5 mm, apertural and dorsal views (SBMNH 350388) Bahía la Cholla, Sonora, México, ex Berry Collection.

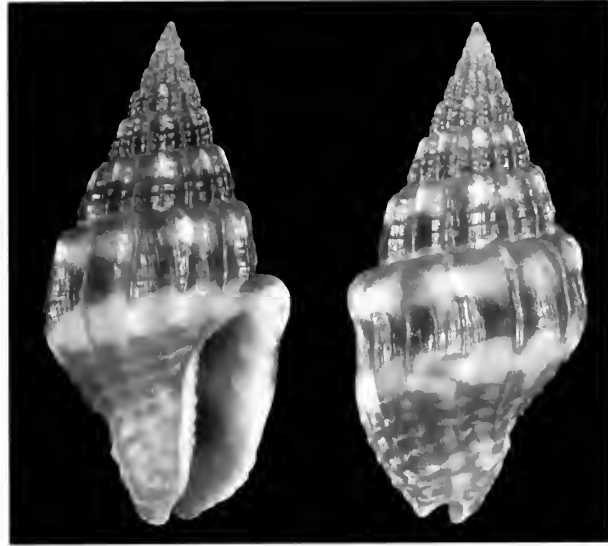


Figure 4. *Anachis scalarina*, length 21.8 mm, apertural and dorsal views (SBMNH 354418), Kobbé Beach, Canal Zone, Panamá, ex Skoglund Collection.

protoconch indicate a harder life because of the extreme tides in the upper Golfo de California?

*Anachis scalarina* (Figures 2, 4), originally described from Panamá, is a white shell with brown bands and a white aperture. The spire is tabulate. It has a slight, somewhat rounded indented area on the outer lip below the suture. There are always two large white teeth near the anal groove followed by several smaller ones that sometimes fade toward the anterior end, but can be quite distinct. A thickening just below the suture as it meets the aperture gives a slightly rounded effect to the anal groove rather than the apically directed notch found in *A. pachyderma*. The largest specimen seen is 22.1 x 10.0 mm. A color variant from Panamá (CS) is white with golden yellow bands.

### Distribution

From the material studied, *A. pachyderma* is a common species found on the undersides of rocks in the intertidal zone along the Sonoran coast of the Golfo de California, from Bahía la Cholla (Choya) (Figure 3) (SBMNH 350388, CS, JCH); as far south as Mazatlán, Sinaloa (SBMNH 350387, CS, CJH); and Manzanillo, Colima (SBMNH 354354), México. To my knowledge, *A. pachyderma* has not been found south of Manzanillo. *Anachis pachyderma* is also found on the other side of the upper Golfo de California from San Felipe (JCH) and

Puertecitos (SBMNH 293270), to Bahía Gonzaga (SBMNH 29332), Baja California.

*Anachis scalarina* is a common species found on the undersides of rocks in the intertidal zone of many localities along the coast of Panamá (SBMNH 25086, CS, JCH, KLK). One lot was also from Isla Pedro González, Archipiélago de las Perlas, Panamá (SBMNH 350385). *Anachis scalarina* seems to be less common north of Panamá. Only three lots from México were seen. Two were from Mazatlán, Sinaloa (SBMNH 118619; 354352), and one from La Cruz de Huanacastle, Nayarit (SBMNH 354353). No other material was found in collections from these last two localities. A single lot trawled in depths of 12-15 m, off Metalio, Departamento Sonsonate, El Salvador (KLK) completes the list of material seen.

### Acknowledgments

I thank Paul Valentich-Scott and Henry Chaney for use of material at the Santa Barbara Museum of Natural History and discussions concerning this paper. Kirstie L. Kaiser, and Jules and Carole Hertz, have provided study material. The *Anachis scalarina* syntype photo was part of George Radwin's material and I assume taken by him. I thank Kathie Way for information on the type material and the Trustees of the National Museum of Natural History, London, for permission to

TABLE I. COMPARISON OF *ANACHIS PACHYDERMA* WITH *ANACHIS SCALARINA*

FEATURE	<i>ANACHIS PACHYDERMA</i>	<i>ANACHIS SCALARINA</i>
Shell color	purple-brown, with white spots between ribs; white band at periphery; aperture purple-brown in fresh specimens	white; spire gold-brown with white on some nodes; dark brown bands above the suture and at the periphery; lighter brown on base; aperture white
Protoconch	3 smooth, rapidly expanding whorls; 1st white, 2-3 golden-brown; seen only on immature specimens	3 smooth golden-brown whorls; 1st flattened
Spire	6 slightly tabulate to straight-sided whorls with ribs becoming larger and farther apart with each whorl, first 4 whorls brown, striate; next 2 with white blotches below the sutures and spirals lacking	6 tabulate whorls, first 5 almost reticulate, with axial ribs slightly stronger than spiral striae; 6th whorl with white blotches below suture, axial ribs more widely spaced, spiral ribs reduced
Suture	slightly impressed, wavy	impressed, straight
Body whorl	11 strong axial ribs, dorsal ribs often obsolete at periphery; 8-10 raised spiral cords on base	15 strong axial ribs continue to base; spiral cords obsolete except for 8 -10 spotted with white on base
Aperture	color purple-brown on fresh specimens; outer lip very slightly indented below the suture for about 1/5 of its length, occasional specimens with faint teeth on outer lip; columella smooth, sometimes with faint denticles, parietal callus somewhat appressed; faint swelling on columellar side of smooth apically directed anal groove; siphonal canal shorter than in <i>A. scalarina</i>	color white; outer lip with small somewhat rounded indentation below the suture; outer lip with large posterior-most denticle delimiting the anal groove, followed by another large tooth and several smaller teeth fading towards anterior canal; inner lip with parietal callus erect, becoming appressed as it nears the anal groove; 8 -9 columellar nodes reflecting the raised spiral cords on the base; siphonal canal longer than in <i>A. pachyderma</i>
Periostracum	fibrous, tan-brown; thin to missing; shell color showing through periostracum	fibrous, tan-brown; very heavy, obscuring shell color; present on most specimens

publish the photographs. The syntype figures from Keen (1968) are printed with permission of *The Veliger*. My thanks to Patricia Sadeghian and Paul Valentich-Scott for photography.

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## JEAN McCREERY CATE (1917-2001) A BIOGRAPHICAL SKETCH AND MALACOLOGICAL PUBLICATIONS

LINDSEY T. GROVES

Natural History Museum of Los Angeles County, Malacology Section  
900 Exposition Boulevard, Los Angeles, California 90007, USA  
E-mail: lgroves@nhm.org

### Introduction

Jean McCreery Cate (Figure 1) was born on July 13, 1917 in Detroit, Michigan and passed away on September 11, 2001 (a rather infamous day in American history) in San Diego, California. She was educated in public and private schools in San Francisco and New York and attended the University of California, Los Angeles from 1936 to 1940 where she majored in English composition and literature. Jean also studied for a time at the New York School of Interior Design (Anonymous, 1968).

Jean and husband Crawford's interest in shells began in 1950 with the gift of a polished specimen of *Trochus niloticus* that had been handed down as a family heirloom (Anonymous, 1968; Groves, 2004). They never dreamed that this specimen would lead to 30 plus years of collecting and studying shells. At the encouragement of Rose and John Q. Burch, from whom they purchased numerous specimens, Jean and Crawford began attending meetings of the Conchological Club of Southern California. Soon thereafter they both decided to specialize in different families, Crawford with the cowries (family Cypraeidae) and Jean with the mitres (families Mitridae and Costellariidae). Jean's early ambition was to completely revise these families. However, it was readily apparent that this task was immense; she estimated that there were at least 400 to 500 known species and well over 3000 species names known (Anonymous, 1968). Jean and Crawford, along with Rudolf Stohler, were instrumental in the formative years of *The Veliger* and its governing body the California Malacozoological Society, Inc. [CMS] (Cate, 1989). After discovering several typographic errors in



Figure 1. Jean McCreery Cate (ca. 1989). Photo: Jennifer Nelson.

volume 2, no. 4 [1960], she became assistant editor and was assigned the task of proof reading each issue. She was officially promoted to associate editor and CMS manager in 1964 with the publication of volume 6, no. 4 [1964] a position that was held until the publication of

volume 29, no. 4 [1987]. Because Jean and Crawford lived in Los Angeles, editing chores required her to fly to Berkeley on a quarterly basis to assist with editing. In 1970 Jean and Crawford moved to Sanibel Id., Florida, which meant that editing tasks were accomplished via air mail. They returned to southern California in 1975 and settled in Rancho Santa Fe, San Diego Co. Unfortunately, Crawford suffered a stroke in 1977 and was a semi-invalid until his death in 1981. Jean then moved to a smaller house also in Rancho Santa Fe.

Failing eyesight required that Jean resign from the CMS bookkeeping chores in 1975. Fortunately, she could still read proofs and continue handling dues, subscription payments, and general correspondence.

Jean was appointed CMS bursar by president Cadet Hand in 1979 to verify vouchers, pay the bills, and provide quarterly accounting reports (Cate, 1989). She was elected to the CMS executive board as a trustee in July of 1982.

Jean and Crawford were active members of numerous national and international malacological organizations including the Western Society of Malacologists (charter members), the Pacific Division of the American Malacological Union, the Hawaiian Malacological Society, the Conchological Society of Great Britain and Ireland, the Keppel Bay Shell Club, and the Malacological Society of Japan amongst others. They were also members of several local shell clubs including the Conchological Club of Southern California (now merged with the Pacific Shell Club and known as the Pacific Conchological Club) and were bestowed with honorary membership in 1978, the San Diego Shell Club, and the now defunct Santa Barbara Shell Club.

In addition to collecting shells, Jean also loved collecting antiques, shell photography, and collecting owls of every description – except live ones (Anonymous, 1968). As music lovers, she and Crawford rarely missed a concert by the Los Angeles Philharmonic at the Los Angeles Music Center or the Hollywood Bowl.

In the late 1960s Jean founded “Shellectures,” a non-profit educational venture which loaned recorded programs with slides on shell related topics to shell clubs nationwide.

Jean was a generous person who went out of her way to assist other researchers. I first met her in October of 1988 and half jokingly asked if she happened to have any of Crawford’s reprints available, as my research on fossil and Recent cowries was just beginning. Sadly she announced that none were left. However, you can

imagine my excitement when she called several days later to tell me that she had found a nearly complete set for me including his landmark volumes on ovulids and triviids! Her only request was that I never sell them and made me promise to pass them on to another beginner when I no longer had a need for them. She was that kind of person. Unfortunately, Jean spent the last few years of her life in an assisted living facility in relative seclusion. Her generosity and friendship will always be cherished.

### Molluscan Species Named by Jean M. Cate

Jean described 12 species and one subspecies of mitrid gastropods. All but three have been relegated to synonymy with previously described species and one of the three is actually a volutomitrid (family Volutomitridae). Species are listed alphabetically regardless of original or current generic designations.

Abbreviations used herein: **AMNH** = American Museum of Natural History, New York; **BMNH** = The Natural History Museum, London; **BPBM** = Bernice P. Bishop Museum, Honolulu, Hawai‘i; **CAS** = California Academy of Sciences, San Francisco; **LACM** = Malacology Section, Natural History Museum of Los Angeles County, California; **MCZ** = Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; **MNHN** = Musée National d’Histoire Naturelle, Paris; **OBIS** = Ocean Biogeographic Information System: Indo-Pacific Molluscan Database (compiled by **ANSP**, **Australian Museum**, **MNHN**, and **CAS**; see [http://data.acnatsci.org/obis/find\\_mollusk.html](http://data.acnatsci.org/obis/find_mollusk.html));

**SAF** = South African Museum, Capetown, South Africa. **SU** = Stanford University [collections now at **CAS**]; **USNM** = National Museum of Natural History, Smithsonian Institution, Washington, DC; **WAM** = Western Australia Museum, Perth.

### Superfamily MURICOIDEA Rafinesque, 1815 Family MITRIDAE Swainson, 1831

*barrywilsoni*, *Pterygia* J.M. Cate, 1968b: 86, pl. 11, figs. 2a-b.

**Type Locality:** Nightcliffe, Darwin, Northern Territory, Australia (12°20'S, 130°59'E).

**Type Material:** Holotype WAM no. 334-66.

**Remarks:** Considered a valid species in the genus/subgenus *Scabricola* (*Scabricola*) by Pechar et al. (1980), Cernohorsky, (1991), and in OBIS, 2003.

*boswellae*, *Mitra* (*Mitra*) J.M. Cate, 1964: 219, pl. 28, figs. 1a-b.

**Type Locality:** Off Durban, Natal, South Africa (29°51'S, 31°00'E).

**Type Material:** Holotype SAF no. A29799.

**Remarks:** Considered a junior synonym of *Mitra guttata* Swainson, 1824, by Cernohorsky, (1970, 1976) and in OBIS, 2003.

*gilbertsoni*, *Pterygia* J.M. Cate, 1968b: 85, pl. 11, figs. 1a-d.

**Type Locality:** Off Rottnest Id., near Fremantle, Western Australia, Australia.

**Type Material:** Holotype WAM no. 1129-67, paratype AMNH no. 203843 (Boyko & Cordeiro, 2001).

**Remarks:** Considered a valid species in the genus/subgenus *Mitra* (*Dibaphimitra*) by Cernohorsky (1970, 1976).

*langfordiana*, *Mitra* J.M. Cate, 1962e: 81-83, pl. 10, figs. 1-2; pl. 11, figs. 1, 3-4.

**Type Locality:** Pokai Bay, Waianae, Waianae Dist., Oahu, Hawaiian Ids. (21°27'N, 158°12'W).

**Type Material:** Holotype BPBM no. 215317, 4 paratypes AMNH nos. 203833a-c, 203834 (ex J. Cate collection), 1 paratype CAS no. 12407, and additional paratypes in the collection of E. Harrison (Boyko & Cordeiro, 2001).

**Remarks:** Considered a subspecies of *Neocancilla papilio* (Link, 1807) by Pechar et al (1980) and a junior synonym of *N. papilio* (Link, 1807) by Cernohorsky, (1970), Kay (1979), and in OBIS, 2003.

*prosanguinolenta*, *Mitra* J.M. Cate, 1966:239-241, pl. 23.

**Type Locality:** Mogadishu, Banaadir Reg., Somalia (2°00'N, 45°17'E).

**Type Material:** Holotype in MNHN.

**Remarks:** Considered a junior synonym of *M. sanguinolenta* Lamarck, 1811, by Cate (1967a) and Cernohorsky (1970).

*rapanuiensis*, *Strigatella* J.M. Cate, 1968b:87, pl. 11, figs. 4a-b.

**Type Locality:** Easter Id. (29°00'S, 109°30'W).

**Type Material:** Holotype CAS no. 13103; paratype AMNH no. 203844, 3 paratypes CAS nos. 13104-13106 (Boyko & Cordeiro, 2001).

**Remarks:** Considered a junior synonym of *Mitra* (*Strigatella*) *picta* Dillwyn, 1817, by Cernohorsky (1970)

and a junior synonym of *M. (S.) flavocingulata* Lamy, 1938, by Cernohorsky (1976) and Rehder (1980).

#### Family COSTELLARIIDAE MacDonald, 1860

*coloscopulus*, *Vexillum* J.M. Cate, 1961b:6-8, pl. 1; pl. 2, figs. 1a-3b.

**Type Locality:** Cape Melville, Balabac Id., Palawan Prov., Philippines (7°30'N, 117°00'E).

**Type Material:** Holotype CAS no. 12363.

**Remarks:** Considered a junior synonym of *V. (V.) citrinum* (Gmelin, 1791) by Turner (2001) and in OBIS, 2003, and a junior synonym of *V. (V.) regina* Sowerby, 1828, by Cernohorsky (1970).

*coronense*, *Vexillum* J.M. Cate, 1968b:88-89, pl. 11, figs. 5a-5b

**Type Locality:** Coron Id., Calamian Group, Palawan Prov., Philippines (12°10'N, 120°13'E).

**Type Material:** Holotype CAS no. 13112, paratype AMNH no. 203845 (ex J. Cate collection) (Boyko & Cordeiro, 2001).

**Remarks:** Considered a junior synonym of *V. (Costellaria) militaris* Reeve, 1845, by Cernohorsky (1970) and Turner (2001).

*filiareginae*, *Vexillum regina* J.M. Cate, 1961a: 80-82, pl. 18, figs. 6a-6b; pl. 19, fig. 6, pl. 20, figs. 1-10.

**Type Locality:** Cape Melville, Balabac Id., Palawan Prov., Philippines (7°N, 117°E).

**Type Material:** Holotype SU no. 8623, 8 paratypes AMNH nos. 96285 (2) (ex A. D'Attilio collection), 203826-203831, paratype CAS no. 12366, 8 paratypes in F. Dayrit collection, paratype in J. & R. Burch collection [BPBM], paratype MCZ no. 231605, paratype in BMNH, [9 additional paratypes cited in Cate (1961) repository unknown] (Boyko & Cordeiro, 2001).

**Remarks:** Considered a form of *V. (V.) regina* Sowerby, 1828, by Pechar et al. (1980), a junior synonym of *V. (V.) regina* Sowerby, 1828, by Cernohorsky (1970), and a junior synonym of *V. (V.) citrinum* (Gmelin, 1791) by Turner (2001) and in OBIS, 2003.

*kewaloensis*, *Vexillum* J.M. Cate, 1963: 26-27, pl. 5, figs. 1-5.

**Type Locality:** Kewalo, Honolulu Dist., Oahu, Hawaiian Ids. (21°18'N, 157°51'W).



**Type Material:** Holotype USNM no. 333316, paratype AMNH no. 203837 (*ex* J. Cate collection) (Boyko & Cordeiro, 2001).

**Remarks:** Considered a junior synonym of *V. (Costellaria) fortiplicatum* (Pease, 1868) by Cernohorsky (1970), Kay (1979), and Turner (2001), and a junior synonym of *V. (Pusia) fortiplicatum* (Pease, 1868) in OBIS, 2003.

*moana*, *Vexillum* J.M. Cate, 1963: 28-29, pl. 5, figs. 6-10.

**Type Locality:** Waikiki, Honolulu Dist., Oahu, Hawaiian Ids. (21°18'N, 157°51'W).

**Type Material:** Holotype USNM no. 338665, 7 paratypes USNM no. 333027, 3 paratypes AMNH no. 203838 (Boyko & Cordeiro, 2001).

**Remarks:** Considered a junior synonym of *V. (Costellaria) leucozonias* Deshayes, 1834 by Kay (1979) and a junior synonym of *V. (Costellaria) leucozonias* (Laborde & Linant, 1834) in OBIS, 2003.

*sitangkaianum*, *Vexillum* J.M. Cate, 1968b: 86-87, pl. 11, figs. 3a-3b.

**Type Locality:** South Lagoon, Sitangkai, Sibutu Id., Sulu Archipelago, Sulu Prov., Philippines (4°50'N, 119°50'E).

**Type Material:** Holotype WAM no. 1230-67, 1-3 paratypes cited in Cate, 1968b, repository unknown.

**Remarks:** Considered a junior synonym of *V. (V.) vulpeculum* (Linnaeus, 1758) by Cernohorsky (1970), Turner (2001), and in OBIS, 2003.

#### Family VOLUMITRIDAE Gray, 1854

*pailoloanum*, *Vexillum*, J.M. Cate, 1963: 29-30, pl. 6, figs. 11-13.

**Type Locality:** Pailolo Channel between Maui and Molokai, Hawaiian Ids.

**Type Material:** Holotype USNM no. 173008, paratypes USNM nos. 173007, 335266, & 335349.

**Remarks:** Considered a valid species in the genus *Volumitra* by Cernohorsky (1970), Kay (1979), and in OBIS, 2003.

#### Molluscan Species Named After Jean M. Cate

*jeaniana*, *Zoila friendii* C.N. Cate, 1968:222-224, pl. 24, fig. 13.

**Type Locality:** Koks Id., northwest of Caravron, Western Australia, Australia (Lorenz, 2001) paratype in N. Harold collection (Perth, Western Australia), 1

paratype in A. Kalnins collection (Mayfields, Western Australia), 2 paratypes in T. Gurr collection (Carlisle, Western Australia).

**Remarks:** Considered a valid full species by Lorenz & Hubert (2000) and Groves & Weil (2003).

*jeancateae*, *Thala* Sphon, 1969:85-88, fig. 1, pl. 6, fig. 4.

**Type Locality:** From 91.5-109.8 m, off Caleta Tagus, Isla Isabella (=Albemarle Id.), Islas Galápagos (0°16'45"S, 91°22'52"W).

**Type Material:** Holotype LACM no. 1202, 1 paratype CAS.

**Remarks:** Considered a valid species by Cernohorsky (1970) and Keen (1971).

*jeanae*, *Aperiovula*, C.N. Cate, 1973:37, figs. 73, 73C.

**Type Locality:** Enshu-nada, between Izu-hanto and Isewan, Honshu, Japan (34°00'N, 139°30'E).

**Type Material:** Holotype LACM no. 1187, paratype LACM no. 1898.

**Remarks:** Considered a valid species in the genus/subgenus *Primovula* (*Aperiovula*) by Okutani & Sasaki, 2000, treated as a valid *Aperiovulva* by Higo et al., 1999, Fehse, 2001, and in OBIS, 2003, and a valid *Pseudosimnia* by Liltved, 2000.

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Many thanks to James H. McLean and Ángel Valdés (LACM) for critically reading the manuscript. Mary Jo (Jody) Woolsey (Los Angeles, California) and Beatrice Burch (Bremerton, Washington) shared their personal recollections of Jean Cate.

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
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## PROGRAM

### Touring Papua New Guinea

Member Don Pisor will present a slide program, with a display, on his trip to New Guinea aboard a catamaran touring on the Sepic River and the Tobriand Islands off the SE end of Papua New Guinea..

Meeting date: June 16, 2005

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting – May 19, 2005

In the absence of President Jules Hertz, the meeting was called to order by Vice-President John LaGrange at 7:45 p.m. The minutes of the previous meeting were approved as printed in *The Festivus*. Treasurer Silvana Vollero announced that April's Annual Shell Auction/Potluck had been both a social and financial success.

September 10 will be the date of the "September Party" to be held at the home of Larry and Debbie Catarius. Details will follow later. Larry also announced that he is looking for someone who would enjoy diving for shells with him anywhere between San Diego and Santa Barbara.

John LaGrange introduced Club Science Fair winner Evan Morikawa, a local high school student, who presented an overview of his winning project *Parthenogenesis: Optimizing Virgin Birth in Sea Urchins*. Parthenogenesis is an alternative way to grow an embryo without fertilization and may be implicated in the current interest in stem cell development.

Evan's research found the best way to get sea urchin cells to divide while immersing them in varying concentrations of saline solutions. He was presented with his choice of book award, Barnes' *Invertebrate Zoology* as his prize from the Club.

Paul Kanner was introduced as the speaker of the evening. He has dived and collected shells around the world, yet enjoys the southern California fauna the most. The audience was treated to excellent images of shells from his collection, as well as images of the living mollusks in his home marine aquarium. Pictured were *Cancellaria*, *Calliostoma*, *Forreria*, *Pteropurpura*, *Pteria* and many other highly prized species, all photographed in fine detail and excellent color. It was a program very much enjoyed by all.

The shell drawing was won by Mr. Morikawa, the father of the Club's science fair winner.

The meeting was adjourned at 9:05 p.m. At the refreshment table, cookies were provided by Margaret Mulliner, Wes Farmer and Larry Lovell.

Nancy Schneider

### Last notice of the Joint AMS/WSM Meeting

The program for the Joint AMS/WSM meeting, June 26-30, at the Asilomar Conference Center in Pacific Grove California is now available on the meeting website. Please note that the detailed schedules for individual sessions and field excursions are still under construction, so check back frequently for updates. At this time there are three symposia. The titles are:

"From Development to Extinction: Molluscan Neontology and Paleontology".

"Pacific Island Land Snail Diversity: Origins and Conservation"

"Gastropod Mating Systems".

The program can be found at:  
[http://zeus.calacademy.org/WSM/program\\_index.html](http://zeus.calacademy.org/WSM/program_index.html)

Thanks, and looking forward to seeing everyone there in June.

Peter Roopnarine and Dianna Padilla

### California Sea Grant Awards Funding for Projects Involving Molluscan Research

Among fourteen new grants awarded this year, six researchers have received funding to further their research dealing with mollusks.

Laura Rogers at UC Davis is working with white abalone populations evaluating the effectiveness of current management strategies, and Richard Zimmer and Cheryl Ann Zimmer of UCLA are studying the optimal density, spacing and sex ratio of sexually mature abalone to maximize fertilization. Kaustuv Roy of UC San Diego is studying the effects of harvesting and recreational shore activities on the rocky intertidal ecosystems of southern California, and Robert Shadwick of SIO and Herbert Waite of UC Santa Barbara are working with whelk snail egg capsules to replicate the peptides in their elastic fibers which may have biomedical and industrial applications.

### The Club's Annual September Party Save the Date

Larry and Debbie Catarius have generously offered their home for the September party to be held on Saturday September 10<sup>th</sup> this year. Further details and map for this fun potluck event will be in a later issue.

## NEW DISTRIBUTIONAL RECORDS FOR PANAMIC PROVINCE COLUMBELLIDAE (GASTROPODA)

CAROL SKOGLUND<sup>1</sup>

Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road, Santa Barbara, California, USA  
E-mail: carolskoglund@msn.com

This is the third in a series of papers on distribution of Panamic Province gastropod species in the Skoglund Collection, and perhaps the least complete. This is partly because these small gastropods are so much alike that it is hard to draw the line between species, and partly because no *Strombina* are listed. Only those species I feel sure are correctly identified are included herein, but there are probably many more that could be described as new in the future if anyone wants to take on a very big job. New distributions for the *Strombina* in my collection have already been published (Jung, 1989).

New information is given herein for 25 species of columbellids (Table 1). These species were all self collected except for the seven marked with asterisks. Keen (1971) and Skoglund (2002) were used for currently known distributions

within the family.

My thanks to Valentín Mogollón for the shells from Perú and for allowing me to list them in this paper.

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2002. Panamic Province Molluscan Literature. Additions and Changes from 1971 through 2001. III Gastropoda. The Festivus Supplement to Vol. 33, 286 pp. (Mar. 28).

TABLE 1: NEW DISTRIBUTIONAL INFORMATION FOR 25 SPECIES OF PANAMIC COLUMBELLIDAE

Species	New records	Depth
<i>Columbella haemastoma</i> Sowerby, 1832	Puerto Escondido, Baja California Sur, México	intertidal
<i>Aesopus fredbakeri</i> Pilsbry & Lowe, 1932	Bahía de Cuastecomate, Jalisco, México	12 to 30 m
<i>Aesopus osborni</i> Hertlein & Strong, 1951	Bahía de Cuastecomate, Jalisco, México	12 to 30 m
<i>Costoanachis adelinae</i> (Tryon, 1883)	La Cruz de Huanacastle, Bahía Banderas, Nayarit, México	intertidal
<i>Costoanachis decimdentata</i> (Pilsbry & Lowe, 1932)	Barra de Navidad, Jalisco, México	intertidal
<i>Costoanachis hannana</i> (Hertlein & Strong, 1951)	Estero San José, Guerrero Negro, Baja California Sur, México	intertidal

<sup>1</sup> Mailing address: 3846 E. Highland Avenue, Phoenix, AZ 85801, USA.



Species	New records	Depth
<i>Costoanachis moesta</i> (C. B. Adams, 1852)	Camerones, Esmeraldas, Ecuador	intertidal
<i>Costoanachis ritteri</i> (Hertlein & Strong, 1951)	Punta de Mita, Nayarit, México	8 to 20 m
<i>Costoanachis teevani</i> (Hertlein & Strong, 1951)	Bahía de Cuastecomate, Jalisco, México	12 to 30 m
<i>Costoanachis varia</i> (Sowerby, 1832)	Bahía la Cholla, Sonora, México Off Pasorja, Guayas, Ecuador	intertidal 3 to 7 m
<i>Costoanachis lilliana</i> (Whitney, 1978)	Puerto San Carlos, Bahía Magdalena, Baja California Sur, México Punta Jacinto, Salinas, Ecuador	2 to 5 m intertidal
<i>Parvanachis albonodosa</i> (Carpenter, 1857)	Puerto San Carlos, Bahía Magdalena, Baja California Sur, México Bahía la Cholla, Sonora, México	2 to 10 m intertidal
<i>Parvanachis dalli</i> (Bartsch, 1931)	Isla Jesusita, Golfo de Nicoya, Costa Rica	intertidal
* <i>Parvanachis guerreroensis</i> (Strong & Hertlein, 1937)	*Los Frailes, Baja California Sur, México *Playa Novellero, Nayarit, México	dredged 8 to 15 m
<i>Decipifus dictynna</i> (Dall, 1919)	Isla Smith, Bahía de los Angeles, Baja California, México Bahía Tenacatita, Jalisco, México	intertidal 6 to 20 m
* <i>Mitrella densilineata</i> (Carpenter, 1864)	Bahía San Francisco, Nuevo Guaymas, Sonora, México	dredged
<i>Mitrella harfordi</i> Strong & Hertlein, 1937	Off Bahía la Cholla, Sonora, México	6 to 16 m
* <i>Mitrella santabarbarensis</i> (Gould & Carpenter, 1857)	Caleta Punta Sal, Tumbes, Perú	intertidal
* <i>Nassarina vespera</i> Keen, 1971	*South of Santa Rosalia, Baja California Sur, México Los Frailes, Baja California Sur, México	12 m 0 to 66 m
* <i>Zanassarina anitae</i> (Campbell, 1961)	Puerto de Talara, Piura, Perú	intertidal
<i>Zanassarina atella</i> (Pilsbry & Lowe, 1932)	Norse (Sandy) Beach, Sonora, México	intertidal
* <i>Zanassarina cruentata</i> (Mörch, 1860)	Cabo Blanco, Piura, Perú	intertidal
* <i>Zanassarina poecila</i> (Pilsbry & Lowe, 1932)	Off Ensenada de los Muertos, Baja California Sur, México	60 m
<i>Parametaria dupontii</i> (Kiener, 1849-50)	Punta de Mita, Nayarit, México	intertidal

NOTES ON *PTEROTYPHIS LOWEI LOWEI* (PILSBRY, 1931)  
WITH SPAWN MASS (GASTROPODA: MURICIDAE)

KIRSTIE L. KAISER

Research Associate, Natural History Museum of Los Angeles County  
900 Exposition Boulevard, Los Angeles, California 90007, USA  
E-mail: klkaiser@pvnet.com.mx

While on the Sea of Cortez Odyssey Expedition aboard the M/V *Ambar III*, I found a specimen of *Pterotyphs* (*Tripterotyphs*) *lowei lowei* (Pilsbry, 1931) at Isla Partida in the Golfo de California. The specimen was collected on 5 Oct. 2002 with SCUBA at 17 m on a sand slope with occasional shell rubble. The animal was underneath and clinging to the interior surface of a bryozoan encrusted clam valve lying on the sand.

Clay Bryce, of the Western Australian Museum, was the expedition photographer and took many in situ photographs of animals observed and/or collected in their natural habitats. Later when developing the film, Bryce noted that the photograph he had taken of *P. (T.) lowei lowei* (Figure 1) showed the specimen with egg mass (Figure 2).

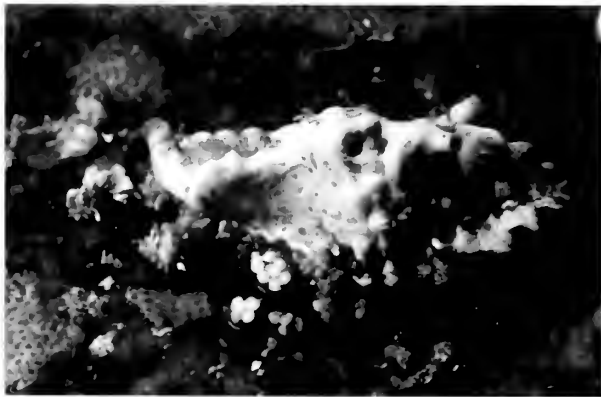


Figure 1. *Pterotyphis lowei lowei* with egg mass in situ. Isla Partida, Golfo de California, México (24°31.80'N, 110°23.328'W). Live, 17 m, H<sub>2</sub>O 84', leg. K.L. Kaiser, diving from M/V *Ambar III*, 5 Oct. 2002. Photo: C. Bryce.



Figure 2. In situ close-up of egg capsules deposited by the animal shown in Figure 1.

Little is known about spawning by typhines and I know of nothing that has been reported previously on egg-laying by *P. (T.) lowei lowei*. Gemmell (1970, 1974) reported on egg laying and spawning of eggs by *Typhisala clarki* (Keen & Campbell, 1964) [as *Typhis coronatus* (Broderip, 1833)] both intertidally and in aquaria. Gemmell (1974) observed a mature female at San Felipe, Baja California, México attaching egg capsules to a small stone in situ. She then transferred several adult animals to small aquaria and noted the entire process from laying of the eggs, to hatching and to the early activities of the veligers.

<sup>1</sup>Mailing address: Paseo de las Conchas Chinas #115 Depto. 4, Fracc. Conchas Chinas C.P. 48390, Puerto Vallarta, Jalisco, México.



Figure 3. Gemmell's 1973 aquarium photograph of *Typhisala clarki* with spawn mass. Courtesy of *The Festivus*.

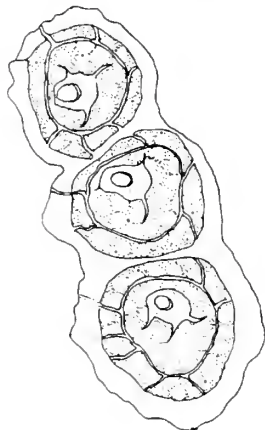


Figure 4. A detailed drawing of the *T. clarki* egg capsules shown in Figure 3. Courtesy of *The Festivus*.

Gemmell (Figure 3) showed the complex spawn mass of *T. clarki* securely deposited on the substratum with the peripheral attachment molded on to the walls of the neighboring capsules, forming a counter-clockwise spiral mass. Each capsule appeared to have a single emergence hatch apically for the hatchlings (Figure 4).

On the other hand, the egg capsules photographed in situ by Bryce, when compared to the spawn mass of Gemmell's *Typhisala clarki*, show surprising differences in the manner in which they are deposited. The *Pterotyphis* (*T.*) *lowei lowei* capsules contained from 5 to 9 eggs and were encased, free-floating, within a larger transparent membrane. This soft, albuminous

fluid-filled larger capsule also appears to be free-floating (it is possible that the individual capsules shown in Figures 1, 2 were dislodged from the mantle cavity when the animal was disturbed upon moving its habitat).

Clarkson (1984: 8) reported but did not figure similar egg masses in the Indo-Pacific species *Tripterotyphis robustus* (Verco, 1895). He described them as having three to four transparent, balloon-shaped capsules, each containing up to ten spherical white eggs approximately 2 mm in diameter.

It was interesting to note that the *T. lowei lowei* was

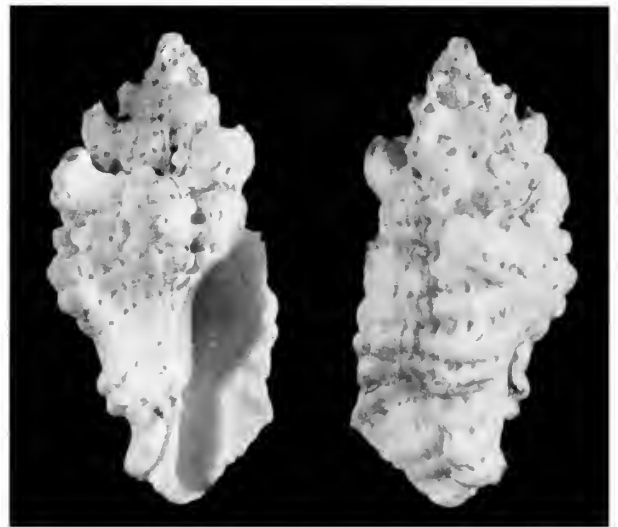


Figure 5. Preserved specimen from Figure 1, showing the fragile, immature outer lip. The lip was most likely fractured at the time it was being collected.

at a period between the secretion of one varix and the maturing of the next one (Figure 5). In discussing shell formation in the family Muricidae, MacKenzie (1961) suggested that in species of the muricid *Eupleura caudata* (Say, 1822), that growth appears to cease at sexual maturity. This does not seem to be the case in the subfamily Typhinae. The figured specimen is in the K. L. Kaiser Collection and is preserved in 97% alcohol. Unfortunately, the egg capsules were not collected with the animal. My thanks to Clay Bryce for photographing the specimen in situ.

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*BAHAMIAN SEASHELLS, A Thousand Species from Abaco, Bahamas*

by Colin Redfern

now in the Club Library

With the proceeds from book and reprint sales, the Club has purchased the excellent (2001) *Bahamian Seashells ...* by Colin Redfern. This 280-page, soft-covered book gives comprehensive discussions and illustrations of 1,000 molluscan species from the island of Abaco, many of which are also found in other areas of the Caribbean, Brazil, the Caribbean coast of Central and South America and the Gulf coast from Texas to south Florida and Bermuda. There are more than 2,700 photographs (124 plates), all taken by the author except for the scanning electron micrographs prepared by Dr. Emilio Rolán. Eighteen plates (107-124) in color include 11 chitons, 80 opisthobranchs and many other living mollusks. All the figured shells were collected from Abaco except for type material. Many of the specimens illustrated were collected as empty shells from sediment samples "to avoid negative effects on the environment." The collection of living specimens was kept to a minimum.

The species, all figured, are listed in taxonomic order based on current classifications, each entered with

scientific name followed by a common name. The species are re-described with maximum sizes given for specimens found on Abaco and information on occurrences for empty shells and habitats for live collected specimens.

The author notes that many of these species had not been previously recorded from the Bahamas including undescribed species figured for the first time. The study is based on more than 108,000 shells collected over a period of over 30 years and limited to those which were collected by the author (or sometimes with collecting buddies), thus ensuring correct locality records.

This book is now available for circulation at Club meetings. It is strongly suggested that you borrow it and enjoy the journey through its pages.

For those interested in purchasing the book, it can be ordered online at <[www.bahamianseashells.com](http://www.bahamianseashells.com)> or by writing to the publisher at Bahamianseashells.com, Inc., 21218 St. Andrews Blvd. #647, Boca Raton, FL 33433, USA. The price is \$114 +\$4 shipping (per book domestic); \$13 overseas surface or \$25 air.

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### The Status of California Abalone Populations

Melissa Neuman, of the National Marine Fisheries  
Service in Long Beach, is working on the Abalone

Recovery Project. She will present a PowerPoint  
program on the efforts to revive the abalone population.

Meeting date: July 21, 2005

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Moon Snails (Naticidae) of the Island of Nevis, West Indies	
Susan J. Hewitt	69



## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting June 16, 2005

The meeting was called to order at 7:40 p.m. by President Jules Hertz. Minutes from the last meeting were approved as published in *The Festivus*. Librarian Marilyn Goldammer reported on the addition of three new books to the library: Bruce Kemp donated a book on Tibias and Harps and John Jackson donated two books, one on reef fish and the other on soft corals.

Wes Farmer attended the meeting of the Botanical Garden Foundation, reporting that there are internal problems with regard to the administration of room reservations. The Shell Club has rented its room for the past 20 years and wishes to continue to do so without being preempted by another renter. Wes will keep us informed of future developments.

The 'September Party' will be at the home of Larry and Debbie Catarius on September 10 at 4:30 in the afternoon. A home playground in their yard will welcome children.

Vice-President John LaGrange introduced Don Pisor, a member of the San Diego Shell Club and shell dealer, as the speaker of the evening. Don and his wife Jeanne recently spent three weeks on a 42 passenger catamaran touring the Sepic River and the Trobriand Islands off the SE end of Papua New Guinea. They hiked to hot water geysers erupting in bubbling pools, where locals cooked their dinner; a (formerly) cannibalistic tribal village was visited; crocodiles sunned on the banks of the river they traveled; each tiny, isolated village welcomed the group with a "sing-sing". They witnessed an annual competition between decoratively costumed native tribes. Elaborate head pieces had been made of curving black and white feathers from the endangered bird of paradise; multi-layered collars of *Cypraea tigris* and other cowries had been combined with pendants of large, flat, black lip oyster shells. It was a very interesting, illustrated program. Items of native craftsmanship were displayed on side tables, many were made of shell or decorated with shells.

Wes Farmer was the winner of the evening's door prize. He and John LaGrange provided their delicious homemade cookies for the refreshment

table. Larry Catarius also provided cookies for the evening.  
Nancy Schneider

### A sample issue of *Portugala* received

The Instituto Português de Malacologia has sent the Club a sample issue of its publication *Portugala*. It is published twice annually, mostly in Portuguese. For anyone interested in subscribing, contact the publication by e-mail at: <ipm@zoomarine.pt>.

### Thirty-third Annual COA Convention at Punta Rassa, Florida

The Conchologists of America announces its annual convention from the 19<sup>th</sup> - 24<sup>th</sup> of July 2005. It will be held at the Sanibel Harbour Resort and Spa at Punta Rassa located on the mainland just before the crossing at the Sanibel Causeway.

Highlights noted are an evening with Peter Dance, an Open House cocktail party at the Bailey Matthews Shell Museum, the annual auction, the Bourse and "a number of presentations on different shell families and related aspects of conchology." Registration forms are available online at the COA website: <<http://conchologistsofamerica.org>>; click on conventions.

### Additions and updates to the *Conus* Biodiversity Website (<http://biology.burke.washington.edu/conus/>)

"We have added color photographic images of primary type specimens of 176 species-group taxa of *Conus* described between 1758 and 1840. These represent about 75% of the species whose types are known to exist. Most of those remaining to be posted are of species described as Cenozoic fossils.

The images of types may be accessed directly via the Type Gallery, and single mouse clicks from there lead to the taxonomic entries and original citations.

The Catalogue has been updated and navigation within it made more user-friendly. Some nominal species-group taxa introduced in 2004 are included, and we would like to be advised of any we have missed. Hard copies of original descriptions are particularly appreciated, and we are willing to post photographs of primary type specimens of new nominal taxa. We particularly thank John Tucker for calling our attention to a number of omissions from the Catalogue."

Alan Kohn <[kohn@u.washington.edu](mailto:kohn@u.washington.edu)>

## MOON SNAILS (NATICIDAE) OF THE ISLAND OF NEVIS, WEST INDIES

SUSAN J. HEWITT

American Museum of Natural History (AMNH)

Send correspondence to: 435 E 77<sup>th</sup> St. Apt 3G, New York, NY 10021

E-mail: hewsub@earthlink.net

### Introduction

I have been visiting Nevis annually in April/May since 1997, usually for two weeks or less. For the first three years I looked at a few shells from a few localities only, but when I visited in the spring of 2000, after Hurricane Lenny had hit the island from the west the previous November and cast up numerous shells, I became seriously interested in compiling a faunal list of Nevis marine shelled mollusks. Much of the work is now complete, and I hope it will be published in a few years. My collecting efforts have focused almost entirely on beach drift shells. The current paper lists the naticids of Nevis that I have found, and also presents a simple comparison with naticid lists from surrounding areas in the western Atlantic.

In general, with a few exceptions, the molluscan fauna of the more northerly parts of the West Indies is better documented than that of the central and southern parts. It appears that essentially no research and very little collecting had been carried out on the marine molluscan fauna of Nevis before I began my investigations. There is no material from Nevis listed in the computerized part of the AMNH catalogue, and while examining Caribbean mollusk species in the AMNH collection, I have so far seen only one (older) non-computerized lot (*Lottia*) from Nevis. Searching the Academy of Natural Sciences at Philadelphia (ANSP) malacology collection database online (9/04) reveals only one lot of Nevis marine mollusks (*Donax*). There are, however, several mentions of species lots from Nevis in the first four volumes of *Johnsonia*, and Rosenberg's Malacolog 3.3.2 9/2004 lists seven species from Nevis, none of which are naticids.

Nevis pronounced "nee-vis" (17°15' N, 62°40' W) (Map 1) is one island of the Caribbean nation of St. Kitts and Nevis, which has been an independent country



Map 1. Caribbean area showing the location of both Nevis and Abaco, with magnified insert showing St. Kitts and Nevis.

since 1983 and which is still part of the British Commonwealth. The islands of St Kitts and Nevis are separated by a shallow channel called "the Narrows", 3.3 km at minimum width. The two islands are in the northernmost part of the Leeward Island chain, about 200 km southeast of the Virgin Islands (Map 1). The smaller island, Nevis, is almost circular in outline, 10 km by 13 km, and the volcano that originally created the island (Nevis Peak, 985 m) still dominates it, though dormant since prehistory and covered in forest. Hot mineral springs near the coastline are the only residual volcanic activity.

Nevis is not well known and is still a quiet, picturesque destination, even though it is well supplied with small hotels, plantation inns, and one luxury resort with a world-class golf course. The population of the island is less than 10,000, and the littoral zone is still relatively unspoiled and unexploited. Fortunately Nevis

is determined to conserve and protect its marine and non-marine fauna and flora, as well as its archeological riches.

Although Nevis is almost circular in outline, the coastline is varied, with many sandy beaches, small rocky points, stretches of rock cobble beaches in the east and some cliffs in the south. As seems to be the case in many Caribbean islands, the Atlantic coast of Nevis is generally less accessible than the Caribbean coast because of fewer roads. Beach drift is often very sparse on most beaches, but after major storms the drift can be profuse in one or two locations.

Naticidae is a family of voracious marine predators, living in sand and drilling neat, countersunk holes in the shells of bivalves and also in a few gastropods including other smaller naticids. As for the origin of the generic name *Natica* Scopoli, 1777, in the past various authors have attempted to derive this word from the Latin vocabulary, suggesting that the name came from the word *natio* meaning tribe, or from the word *nativus*, natural, or from *natalis*, relating to birth, or from the verb *nato*, *natare* meaning to swim. However, Giovanni Antonio Scopoli (1723-1788) was from Italy, and in Italian the word *natica* simply means buttock from the Latin root *natis*, plural *nates*. It seems logical, under the circumstances, to assume that the Italian word *natica* was Scopoli's source for the name *Natica*, and that he was referring to the rounded contour of the shell. The Nevis naticid shells reported here were dead-collected from beach drift with specific written permission from the Government Fisheries Officer of Nevis.

## Results

In Table 1, 13 naticid species from Nevis are listed in alphabetical order and each given a number. Also shown are indications of abundance, maximum size (a measurement of the maximum diameter of the largest shell found), and shell color. For each of the 13 species found, one or more specimens were selected and photographed in black and white. These are shown, with two views of each specimen, on the four plates and the species are numbered as in Table 1. Where more than one shell of a species was found, the shell illustrated was usually selected on the basis of best state of preservation. Therefore a few of the shells shown are smaller than the maximum sizes listed in Table 1.

Some shells shown in the photographs are relatively fresh, others are somewhat faded and/or beachworn. In most cases the diagnostic features for identifying each species are visible. However, in the case of *Sigatica*

*semisulcata* (Gray, 1839) the incised lines below the suture and around the aperture are present in the shell, but not clearly visible in the photographs (Figure 8). The shell of *Sinum maculatum* (Say, 1831) (Figure 9), has been quite badly damaged around the aperture, and the glossy interior of the shell shows an apparent white streak which is a reflection of the light used to illuminate it.

One species, *Natica marochiensis* (Gmelin, 1791), has not been found recently and is a historical record only. A beachworn specimen of this species (Figure 3) was present in a shell collection made in the 1970s by Ester Westerfelt, who during that time owned and lived half of each year in a house called "Yamseed" which is now a small inn near the airport at Newcastle Beach, on the north coast of the island. Westerfelt's collection was posthumously donated to the Museum of Nevis History at the Alexander Hamilton House in Charlestown, Nevis, which is administered by the Nevis Historical and Conservation Society.

Two shells of *Naticarius canrena* (Linnaeus, 1758) are illustrated as Figures 5a and 5b, a small adult and a juvenile. Although most juveniles of the species have the typical colorful markings, the smaller shell shown here, Figure 5b (14.6 mm), is an example of *N. canrena* form *verae* Rehder, 1947. In this form of *canrena*, the shell color is often tan or brownish with no pattern, or may only show a very subdued version of the typical markings. (A 24 mm example of this form from south Florida is currently (11/2004) displayed at: <http://www.jaxshells.org/natcan.htm>).

The small *N. canrena* form *verae* shell (Figure 5b) was included here for morphological comparison to the shell of *Natica marochiensis*, in an attempt to clear up a common source of error. It has been my observation that these unmarked or poorly marked, tan-colored or brownish specimens of *N. canrena* are fairly often misidentified in both amateur and professional collections as *N. marochiensis*. *Natica marochiensis* is a higher-spined, less broad shell than *N. canrena*, with a smaller, lower aperture. The shell of *marochiensis* is usually of a brown or purplish tint, sometimes with subdued bands of arrow-shaped markings.

In the case of *Polinices hepaticus* (Röding, 1798) two shells are illustrated. Figure 6a is a very large, slightly damaged shell of 50.2 mm maximum diameter, which is close to world record size for the species. This shell was previously inhabited by a land hermit crab, *Coenobita clypeatus* (Herbst, 1791). Figure 6b is a juvenile *P. hepaticus* (24.1 mm) in good condition.

Three shells of *Polinices lacteus* (Guilding, 1834)

Table 1: List of naticids in the beach drift from Nevis, 2000 - 2004

[Maximum size = diameter of largest shell of each species. Rare=not found each year and only one or two specimens when present. Uncommon = few shells, not reliably found each year. Common = usually several shells found. Abundant= almost always numbers of shells found. Local= seems restricted to certain localities. Widespread= found at several sites around the island. \*= from beach drift with micromollusks, which itself is rare on Nevis.]

SPECIES	INCIDENCE IN BEACH DRIFT	MAXIMUM SIZE	SHELL COLOR
1. <i>Haliotina patinaria</i> Guppy, 1876	one only	10.3 mm	Translucent white, some iridescence inside, innermost part of protoconch brown
2. <i>Natica livida</i> Pfeiffer, 1840	uncommon, local	11 mm	Pale brownish gray with darker banding and spotting, white subsutural band, brown umbilical callus, brown inside aperture
3. <i>Natica marochiensis</i> (Gmelin, 1758)	one historical record only, from 1970s	14.6 mm	Pale purplish brown with whitish subsutural band and off-white around umbilicus
4. <i>Natica menkeana</i> Philippi, 1852	one only*	juvenile, $\pm 1.0$ mm	Off-white
5. <i>Naticarius canrena</i> (Linnaeus, 1758)	common, widespread	32.1 mm	Tan, with brown and cream markings, white base, early whorls purple tinted. Small juveniles may have no markings. Very small juveniles often retain a magenta protoconch.
6. <i>Polinices hepaticus</i> (Röding, 1798)	almost common, widespread	50.2 mm	Tan-brown, white around umbilicus and aperture
7. <i>Polinices lacteus</i> (Guilding, 1834)	abundant, widespread	23.4 mm	All white, often with a more intensely white subsutural band. Some juveniles retain a magenta protoconch.
8. <i>Sigatica semisulcata</i> (Gray, 1839)	rare, local	9.1 mm	All white, glossy
9. <i>Sinum maculatum</i> (Say, 1831)	rare, widespread	35 mm	White, heavily tinted with brown and cream bands
10. <i>Sinum perspectivum</i> (Say 1831)	rare	29.1 mm	All white
11. <i>Stigmaulax cancellatus</i> (Hermann, 1781)	one only	12.0 mm	White with pale orange-brown spots in two rows
12. <i>Stigmaulax sulcatus</i> (Born, 1778)	rare, local	12.3 mm	Dark yellow (or off-white) with off-white base
13. <i>Tectonatica pusilla</i> (Say, 1822)	uncommon*	3.9 mm	White with faint brown markings



are shown in Figures 7a-c. Figure 7a is an adult shell of 23.4 mm. Figures 7b and 7c are two juveniles which show the extreme range of variability in morphology at that size. Figure 7b, a 6.5 mm shell, is very globose with a low spire, a fairly open umbilicus and a protruding pink protoconch. Figure 7c shows an extremely worn 8.0 mm shell, which is very high-spined and has a callus that almost covers the umbilicus. Redfern (2001, page 55) has some relevant comments on this form of *P. lacteus*. Most juveniles of the species fall somewhere between these two extremes.

All shells of the genus *Stigmaulax* found so far are shown on the last plate. Figure 11 is the only shell of *Stigmaulax cancellatus* (Hermann, 1781). Figures 12a and 12b are quite typical of the species *S. sulcatus* (Born, 1778), and may be adults, although at 12.9 and 12.4 mm they are not as large as the species can attain. For comparison, images of two shells (Figures 12e and 12f) from a lot of *S. sulcatus* collected by Gordon Nowell-Usticke in 1957 on the island of St. Croix, Virgin Islands (AMNH 191303) are included. The larger shell, 22.3 mm, is quite fresh and shows all the characteristic features well. The smaller shell of 9.4 mm is very beachworn, but is included because it shows clearly that the umbilical area is usually quite wide open, even in juveniles of this (and other) *Stigmaulax* species.

Figures 12c and 12d are two smaller Nevis shells which are atypical in morphology. Figure 12c is proportionately narrower than most *Stigmaulax*, especially in the umbilical area, which is very constricted in this particular shell. This would tend to suggest the shell might represent a different species. But if this shell is not *S. sulcatus* or *S. cancellatus*, there are no other living ribbed *Stigmaulax* species currently known from the Caribbean. Because of this, the possibility that it might be a fossil shell was independently raised by two moonshell specialists who examined photographs of the shell (Alan Kabat, Michael Hollmann, personal communications, 2004). However, Nevis itself has no fossiliferous rocks, and so far I have not been able to find a good match for this shell among the fossil species.

The other small 9.4 mm shell (Figure 12d), found in September 2004 by the Johnson family of Nevis, appears to be from the same population as 12c. It is glossy, and seems closer in morphology to typical *S. sulcatus*. This might indicate that both smaller shells could be a morphological variant of the Recent *S. sulcatus*, although it seems a little odd that both typical and

atypical shells would be washing up on the same small beach.

*Tectonatica pusilla* (Say, 1822), the only representative of the genus in the Caribbean faunal zone, was also found and is illustrated on the third plate, out of numerical sequence.

No naticid opercula are illustrated in this paper because surprisingly few naticid opercula have been found in the drift on Nevis: only one or two small opercula of *Naticarius canrena*. Some naticid shells were observed to have naticid drill holes in them; many shells of *Polinices lacteus* had complete drill holes, even specimens of 5.5 mm, and some *Naticarius canrena* had also been drilled through. But in the case of the very thick shell of *Polinices hepaticus*, I have seen at least one incomplete drilling attempt, but no complete ones.

At this time voucher material for six of the species (*Natica livida*, *Naticarius canrena*, *Polinices hepaticus*, *P. lacteus*, *Sinum maculatum* and *Tectonatica pusilla*) have been deposited in the AMNH (catalogue numbers 311903-311908) and the remaining material is currently in the Susan J. Hewitt collection.

## Discussion

A few species have almost certainly escaped notice because my searches have always been at the same time of year, not every possible collecting locality has been visited, and shells have been found only by examining beach drift material and in one instance was a result of an exchange of shells from a land hermit crab. Nonetheless, Table 1 does provide the first systematic assessment of naticid species diversity in Nevis. However, the measures of relative abundance and maximum size must be viewed with caution because of numerous sampling biases, some of which are listed in the following paragraphs.

Absence of certain species of shells in the drift does not necessarily mean those species do not inhabit the waters around Nevis. Shells of species that live deeper than the most shallow subtidal are only washed up after hurricanes or other major storms, and the truly deep-water species are almost never washed up. Some species may be present in shallower water but could be so uncommon or localized that they have not been found yet in searches of beach drift.

Relative abundance in living populations may not be accurately reflected in the incidence of dead shells from beach drift. For example, survival of the shell itself is variable. Shells of *Polinices hepaticus* are extremely

solid and thick, and so they persist for long periods of time in the beach drift without being destroyed, whereas less robust shells of other species may be easily broken. The small and delicate shell of *Haliotinella patinaria* Guppy, 1876, is quite fragile and may possibly be light enough to be blown inland by strong trade winds. The only shell of this species found was suspended 25 cm off of the substrate on a tangle of dried turtle grass, well above average high-tide level.

As for size indications, this, too, has its limitations: the only intact shells of *Naticarius carena* found so far on the beaches have been small, although broken shells and fragments indicate that larger-sized individuals exist. A collection of shells made by a Nevis resident, Les Windley, during the 1970s, included a *N. carena* of approximately 52 mm in size, but this is not included in the table.

The scarcity of these larger shells on the beaches may be partly due to the influence of the Caribbean land hermit crab species, as mentioned in the Results section of this paper. These crabs are able to locate and take possession of intact shells of various larger marine gastropod species, carrying them extraordinary distances, including up the mountain (Nevis Peak). Live crabs using various species of marine shells taken from the beaches of Nevis have been found at altitudes up to approximately 550 m (Jim Johnson, personal communication, 2004).

Table 2 was assembled in an attempt to put the Nevis findings into a larger biogeographical context. This table compares the Nevis naticid list (highlighted in gray) with those extracted from 15 other western Atlantic marine molluscan lists. The lists have been arranged geographically from Virginia and North Carolina south to Florida and the Bahamas, then west to Alabama and the Yucatan, and then through the Greater and Lesser Antilles south to Brazil, Uruguay and Argentina. As a result, the table demonstrates the geographical appearance, peaking, and disappearance of the tropical Caribbean faunal zone, as reflected in the changing naticid species. The taxonomy, nomenclature and implied synonymy follow Rosenberg, 2004, with some changes suggested by Hollmann (personal communication, 2004).

The list of 28 species used in Table 2 is not comprehensive: a few very rare and deep-water Caribbean species and one of two species of dubious status have been omitted, as have six additional naticid species reported from Argentina which are part of the fauna of the cooler water, more southerly marine faunal

zone sometimes known as the "Southwestern Atlantic Province".

In the case of *Stigmaulax sulcatus* and *S. cancellatus*, malacologists disagree as to whether these are two forms of the same species, or two different species. Viewing large lots of both in the AMNH (collected by Gordon W. Nowell-Usticke in the early 1960s in St. Croix, Virgin Islands) led me to believe that these two are separate species, and thus in Table 2, an attempt was made to separate the records of the two, even in cases where authors (Warmke & Abbott, 1961; Humfrey, 1975; Redfern, 2001) had grouped them together as one species. This separation of records was done by examining photographs and consulting text descriptions.

With the exception of the Uruguayan, Virginian and Puerto Rican lists, only lists having more than 300 species of marine gastropods were used for this table, because the majority of lists smaller than 300 species were found to have too few naticids to make a useful comparison with the Nevis list. Much of the data for Table 2 comes from Rosenberg's Malacolog version 3.3.2 (Western Atlantic Gastropods Database 2004), specifically from the list "Geographic Distributions" at <http://erato.acnatsci.org/wasp/wasp.php/locality> and some from other sources, see Table 2 notes. Other than the Yucatan of Mexico, Brazil, Uruguay and Argentina, no listings from Central or South America were included. However, there are interesting lists in Malacolog 3.3.2 of over 300 gastropod species for other parts of Mexico, and for Panama, Costa Rica, Columbia and Venezuela.

It is necessary to point out that the lists used for comparison in Table 2 are by no means equivalent to one another. Some (Nevis, Abaco) are for relatively small islands, some are for much larger coastal areas (North Carolina, The Yucatan) and one is for the huge coastline of Brazil. Degree of completeness of each list also varies a great deal. Nonetheless, despite all these various limitations, clear patterns emerge and some useful observations can be made.

The Caribbean tropical faunal zone typically begins in the Northern Hemisphere at the points where year-round tropical water temperatures occur: in southern Florida, the Florida Keys and the Bahamas (including, for some species, an outrunner northeast to Bermuda) and thence from Florida south to include all of Brazil. The zone does not include the Gulf of Mexico coast of the USA. However, there are many elements of the Caribbean molluscan fauna which are more

Cay = Cayman Islands.....	378	(Lee, 2004 <i>beta</i> )
Jam = Jamaica .....	574	(Rosenberg, 2004)
PR = Puerto Rico.....	258	(Rosenberg, 2004, Warmke & Abbott, 1961)
Cro = St Croix, Virgin Islands ..	447	(Rosenberg, 2004)
Nev = Nevis .....	300	(Hewitt, in prep.)
Dut = Dutch ABC Islands.....	745	(DeJong & Coomans, 1988)
Bra = Brazil .....	1,130	(Rosenberg, 2004)
Uru = Uruguay.....	110	(Rosenberg, 2004)
Arg = Argentina.....	319	(Rosenberg, 2004)



cosmopolitan, as is clearly demonstrated in Table 2. This table shows some indication of where species occur, how common they might be (or at least how easy they are to find) and how far their range appears to extend.

The ranges for the species featured, as demonstrated by Table 2, are mostly comparable to the ranges indicated by Abbott (1974). (Malacolog 3.3.2 data also include distribution by countries, and give a range for each species by latitude and longitude, which can be generated in map form.)

Starting in the north, the lists for Virginia and North Carolina show two colder water species, *Euspira triseriata* (Say, 1822) and *E. heros* (Say, 1822). *Euspira pallida* (Broderip & Sowerby, 1829) is also on the list for North Carolina. All of these species are at the southernmost limit of their ranges.

On the other hand, *Naticarius canrena*, *Sigatica semisulcata* and *Sinum maculatum* (all three found on Nevis) are also found in North Carolina, at the northernmost limit of their ranges. The range of these species extends from North Carolina through the Gulf of Mexico and down through the Antilles, with *Naticarius canrena* and *Sinum maculatum* reaching as far south as Brazil.

*Tectonatica pusilla* (Say, 1822) is, perhaps, the most widely distributed species on the list, with a range from Maine to Brazil (including Nevis), although, because it is found as deep as 140 meters (Rosenberg, 2004) it may possibly live in cooler, deeper water in the more tropical locations.

There are several species whose range is classically tropical, and these species make their first appearance in southern Florida: *Haliotinella patinaria*, *Natica livida* Pfeiffer, 1840, *N. marochiensis*, *N. tedbayeri* Rehder, 1986 (formerly *N. floridana* Rehder, 1943), *Polinices hepaticus*, and *P. lacteus*. All these except *Natica tedbayeri* have been found on Nevis, and of this group all but *Haliotinella patinaria* are known to occur as far south as Brazil.

*Haliotinella patinaria* is difficult to find and therefore, may be present in more places than are currently shown. In fact with all the rarer species including *Stigmaulax sulcatus*, *S. cancellatus* and *Natica menkeana* (Philippi, 1851) it is not really possible to comment on distribution patterns using the very simple data in Table 2. The disjunct appearance of their distributions may well be an artifact.

No doubt there are additional naticid species living around Nevis which have not yet been found and Table 2 can serve as a predictor: judging from the adjacent

lists, two possibilities would be *Natica tedbayeri* and *Stigmaulax cayennensis* Récluz, 1850. But generally speaking, when compared to lists from nearby locations, the Nevis list seems to be relatively complete, and is probably representative of the local fauna.

If in the future more complete faunal lists are created from small areas in the Caribbean and then compared, this may shed some light on the more general questions raised here about distribution and relative abundance. As a simple forerunner of these more detailed comparisons, the Nevis and Abaco lists are compared in Table 3. Included are indications of relative abundance, and in the case of Abaco, this is indicated for both beach drift shells and live specimens (taken from Redfern, 2001, with additional information from Redfern, personal communication, 2004). But as Redfern (2001, p viii) comments, "Notes on occurrence are subjective, as they refer to the author's own personal collecting experience" and so it remains to be seen if a comparison of this type from two different authors can yield any useful information.

Abaco (as defined by Redfern, 2001) comprises Great Abaco, Little Abaco and the Abaco Cays. This group of islands is part of the Bahamas, approximately 2,000 kilometers northwest from Nevis (Map 1). (Although Abaco is a group of islands, for convenience I have referred to it in this paper as if it were one island.) Nevis is very much smaller at 93 square km, whereas Great Abaco alone is a little over 2,000 square km.

In terms of similarities, each island has a total list of 13 naticid species, out of which 11 species are found on both islands. *Polinices lacteus* and *Naticarius canrena* are common on both islands. Many species that are very uncommon or rare on one island, have somewhat comparable abundance on the other island, or are not found at all. *Natica marochiensis* is local and very uncommon on Abaco and has only one historical record from Nevis; possibly this species may have very specific habitat requirements (interestingly enough, this species also occurs in the tropical eastern Atlantic).

As for the differences between Abaco and Nevis: only one damaged shell of *Polinices hepaticus* was found on Abaco, but it is widespread and almost common on Nevis. *Natica livida* is locally common on Abaco, but seems to be very uncommon and very localized on Nevis, even where it does occur. *Sinum perspectivum* is "considerably more common" on Abaco than *S. maculatum* (Redfern, 2001, p. 56) whereas on Nevis *S. perspectivum* seems to be the rarer of the two



Table 3. Abaco and Nevis: comparison of relative abundances of naticid species

- = not found.

? = not enough sediment available to estimate relative abundance.

\* = mentioned but not illustrated in Redfern (2001).

SPECIES	NEVIS Incidence in Beach Drift Hewitt	ABACO 1 Incidence in Beach Drift Redfern	ABACO 2 Living Specimens Redfern
<i>Haliotinella patinaria</i>	one only	uncommon	-
<i>Natica livida</i>	uncommon, local	common	locally common
<i>Natica marochiensis</i>	one historical record only	very uncommon	rare, very local
<i>Natica menkeana</i>	one only	-	-
<i>Natica tedbayeri</i>	-	very uncommon	-
<i>Naticarius canrena</i>	common, widespread	common	sometimes common
<i>Polinices hepaticus</i>	almost common, widespread	one only	-
<i>Polinices lacteus</i>	abundant, widespread	common	locally common
<i>Sigatica semisulcata</i>	rare, local	uncommon	rare
<i>Sinum maculatum</i>	rare, widespread	rare	-
<i>Sinum perspectivum</i>	rare	uncommon	very uncommon
<i>Stigmaulax cancellatus</i>	one only	uncommon, local	-
<i>Stigmaulax sulcatus</i>	rare, local	one only*	-
<i>Tectonatica pusilla</i>	? uncommon	-	-

NOTE: *Natica ?guesti* omitted from Abaco list, one deep-water crabbed specimen.

species. The possible reasons behind these differences could conceivably have to do with scarcity or abundance of suitable habitat for these particular species, since the biogeography of the coastline of Nevis is very different from that of Abaco. But that question is far too complex to comment on here.

As a more general point, a comparison of the dead and living Abaco lists seems to indicate that beach drift collecting was essential to making the Redfern (2001, p. viii) faunal list for Abaco as complete as it is. Five out of a total of 12 Abaco naticid species were found only in beach drift. No naticid species were found live by Redfern that were not also found in the drift, and it also

appears to be the case, bearing in mind obvious collecting biases, that several species were more commonly encountered as empty beach drift shells than as live animals.

### Conclusion

The naticid list from Nevis shows that the island has a rich naticid fauna, and also demonstrates that, despite various sampling biases, a thorough survey of beach drift material can result in a reasonably accurate assessment of species-level diversity of some mollusks, even within a modest time frame.

### Acknowledgments

I wish to thank Captain Arthur Anslyn M.B.E., Director of Fisheries, Department of Fisheries in the Ministry of Agriculture, Lands, Housing, Cooperatives and Fisheries, Nevis Island Administration, for specific written permission to carry out the Nevis research; the Nevis Historical and Conservation Society for its encouragement and help; and Jim, Nikki, Jessica and Patrick Johnson of Nevis for showing me new collecting localities, driving me to them, helping me with collecting shells, and finding out additional information for me. Colin Redfern generously shared with me extra information on the naticids of Abaco, making it possible for me to draw up the comparison table. I am grateful to Michael Hollmann for considerable help in identifying the smaller and more obscure naticids such as *N. menkeana*, to both Alan Kabat and Michael Hollmann for consulting on the *Stigmaulax* spp. and other questions, and to Dave Mulliner for photographing several of the species. The plates and map were assembled with expert help from Ron Hartley. The notes on Latin and Italian were greatly aided by advice from Mark Garland of Botanical Latin Translations. I also wish to thank Paula Mikkelsen, curator of mollusks at AMNH, for support in carrying out the museum side of the Nevis research, and both Paula Mikkelsen and Ilya Temkin for critically reading drafts of this paper. The information from Gary Rosenberg's database Malacolog 3.3.2 is provided with the permission of the ANSP.

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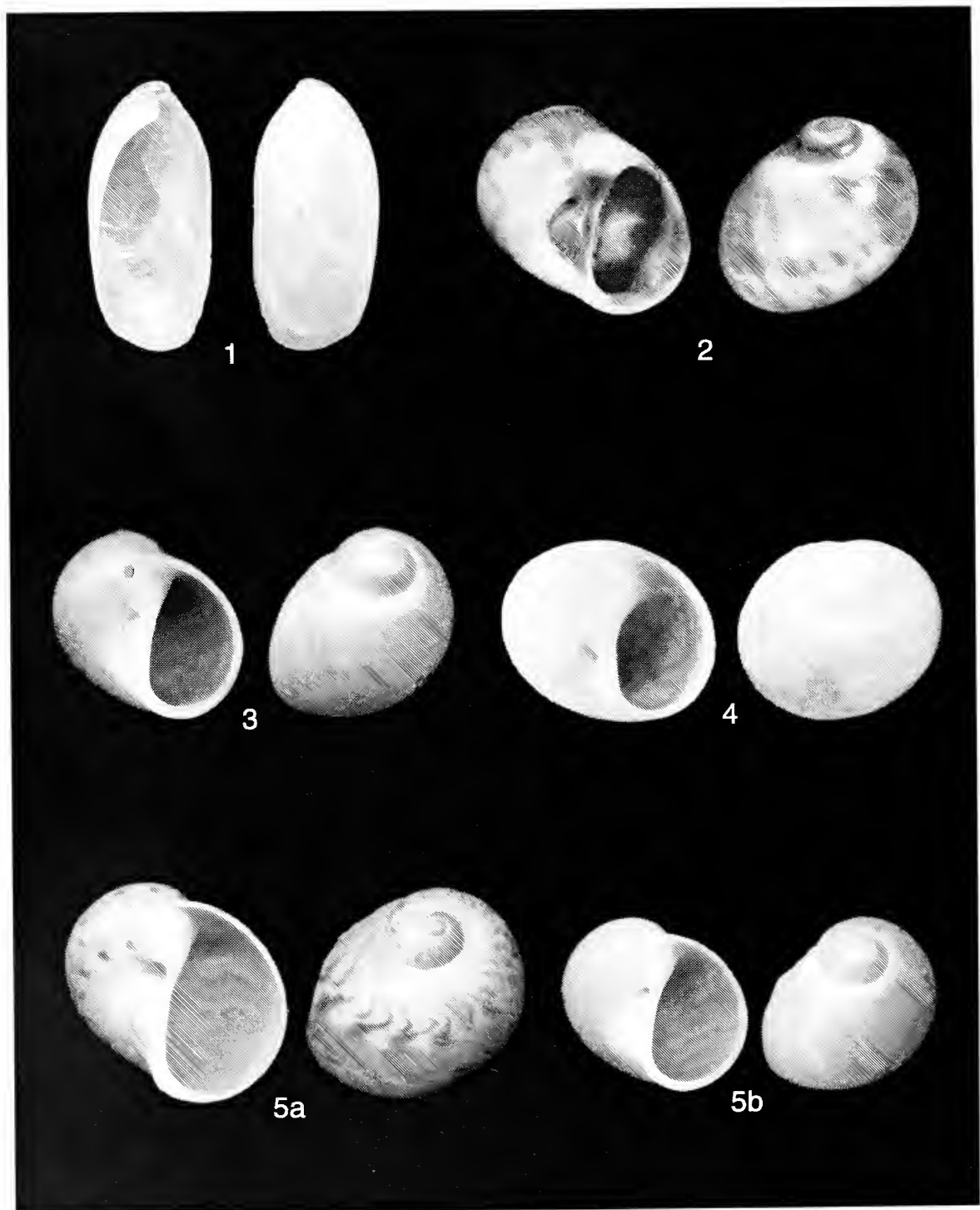


Plate 1, figures 1-5. (1) *Haliotinella patinaria*, 10.3 mm (2) *Natica livida*, 7.8 mm (3) *Natica marochiensis*, 13.4 mm (4) *Natica menkeana*, 1.0 mm (5a, b) *Naticarius canrena*, 32.1 mm, 14.6 mm.

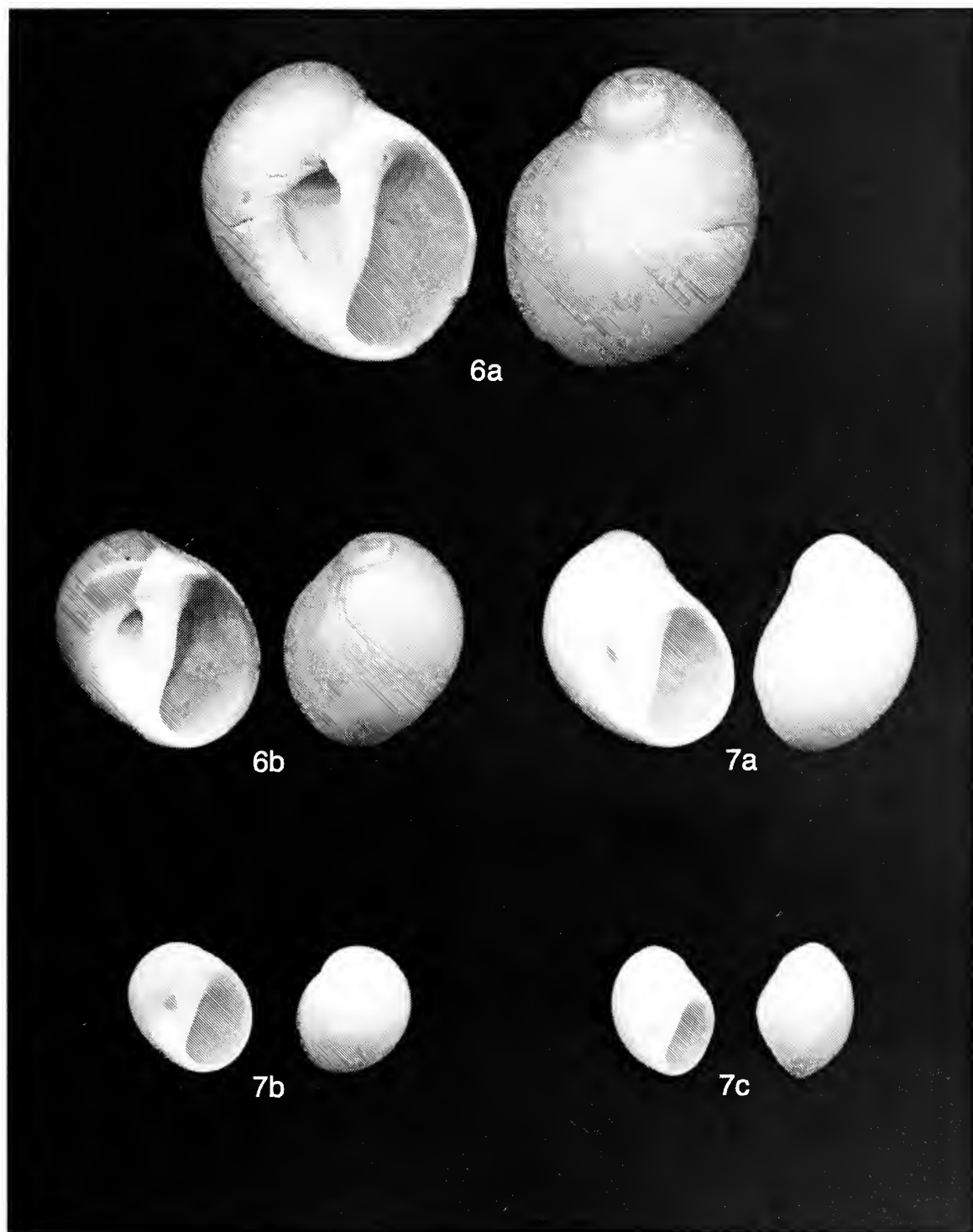


Plate II, figures 6a, b, 7a-c, (6a, b) *Polinices hepaticus*, 50.2 mm, 24.1 mm (7a-c) *Polinices lacteus*, 23.4 mm , 6.5 mm, 8.0 mm.



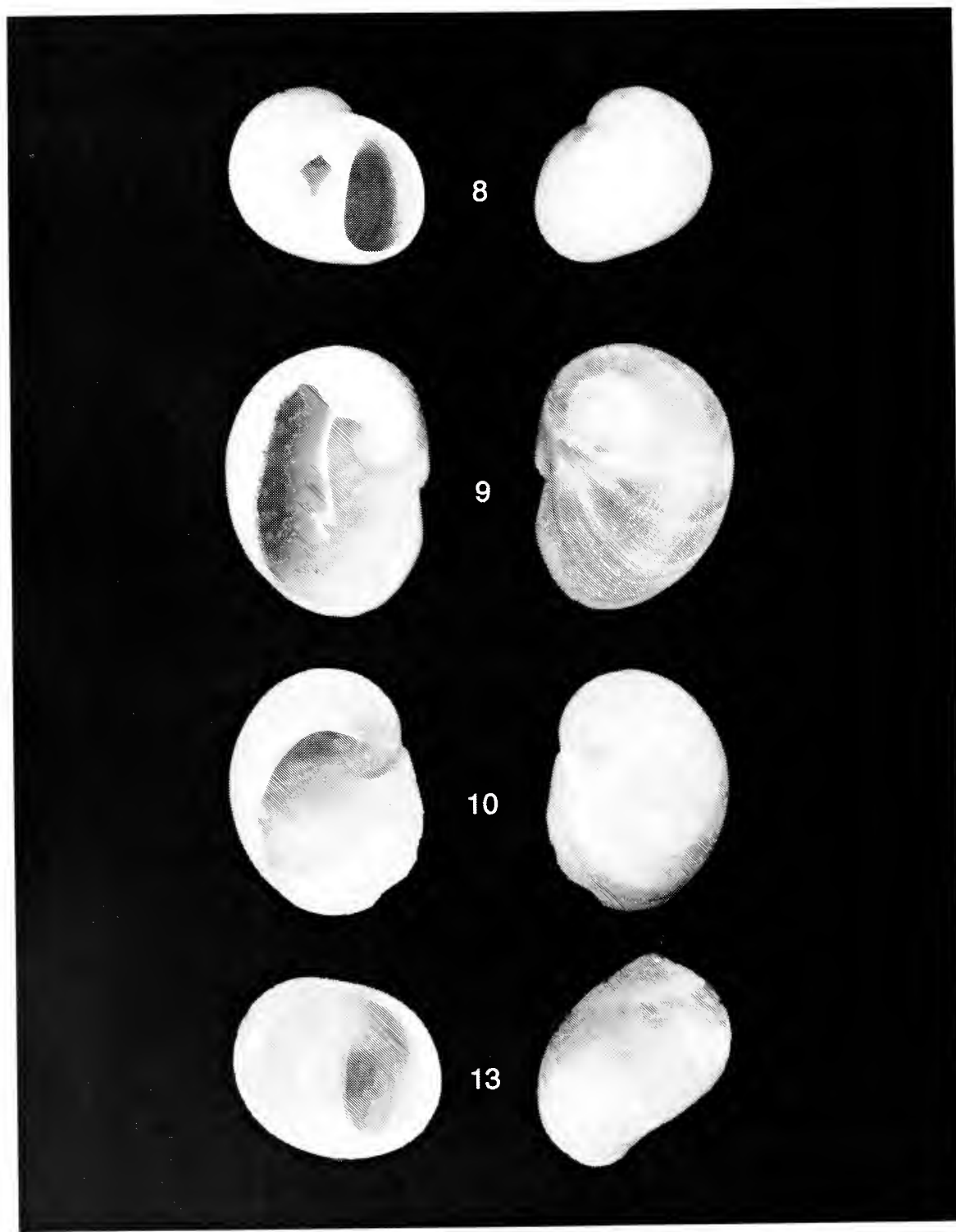


Plate III, figures 8-10, 13. (8) *Sigatica semisulcata*, 9.1 mm (9) *Sinum maculatum*, 23.7 mm  
(10) *Sinum perspectivum*, 29.1 mm (13) *Tectonatica pusilla*, 3.9 mm.

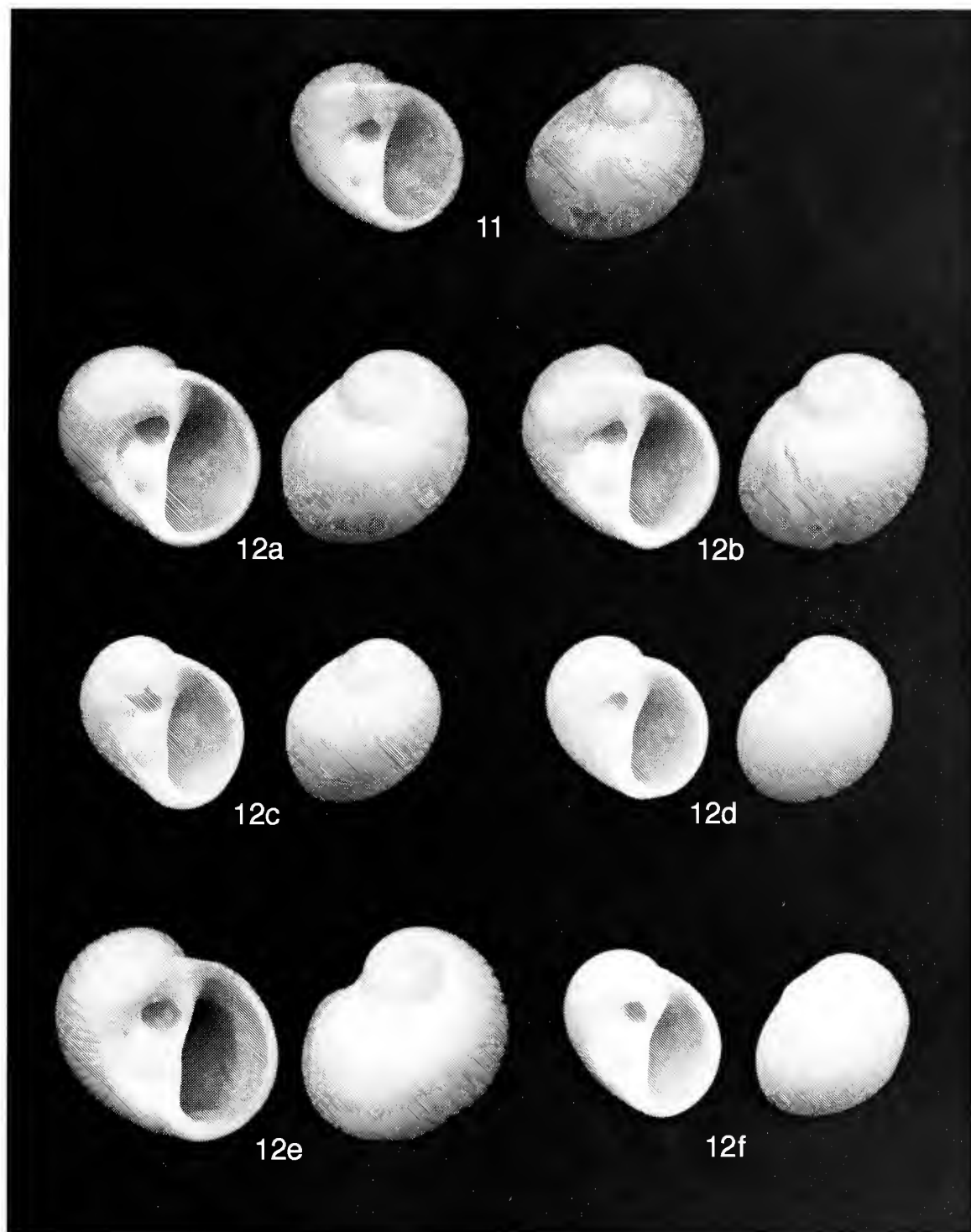


Plate IV, figures 11-12a-f. (11) *Stigmalax cancellatus*, 12.0 mm (12a, b) *Stigmalax sulcatus* 12.9 mm, 12.3 mm (c, d) *Stigmalax ?sulcatus*, 9.4 mm, 9.9 mm (e, f) *Stigmalax sulcatus*, 22.3 mm, 9.4 mm, St. Croix, Virgin Islands, AMNH 191303, G. W. Usticke leg. 1957.

Images 2, 4, 8, 13 by David K. Mulliner, the rest by Susan J. Hewitt.

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PROGRAM

Night Shell Collecting in Panamá: A look at what could be found intertidally in the 1970s

Long time collector, author and Club member Carol Skoglund of Phoenix, Arizona, will present a slide show on collecting in Panamá in the 1970s and will have a display of some the shells she found there.

Meeting date: August 18, 2005

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting July 21, 2005

President Jules Hertz called the meeting to order at 7:45 PM. The minutes of the June meeting were accepted as printed in *The Festivus*.

There were several announcements of interest to the membership. Wes Farmer informed the members of the possibility that our monthly meeting room reservation may be pre-empted by another group; the Club will look into it. T-shirts from 1995 with Club logos were being sold for a bargain \$5 in the back of the room. Kelvin Barwick announced the upcoming SCAMIT meeting on August 8<sup>th</sup>, to be held at the Environmental Monitoring and Technical Services Laboratory building. Also, an updated list of Club library books is available.

Vice-president John LaGrange introduced the evening's speaker, Melissa Neuman. She spoke on the status and trends of black abalone on the California coastline. As an employee of the National Marine Fisheries Service in Long Beach, she monitors data on abalone populations. She informed us that, in some areas, abalone has been locally extinct since the 1960s. White abalone is now on the endangered species list.

Beginning in 1986, a bacterial withering syndrome has killed much of the black abalone. This was well illustrated by photos taken at the same location over a period of several years. Currently 50% of the geographic range of black abalone is severely reduced in abundance. Black abalone was added to a list of species of concern in 1999. The abalone fishery has been closed since 1993, with the 1990s harvest being 5% of that of the 1970s. Abalone normally live 30-40 years.

A lively discussion, from a very interested audience familiar with abalone followed. John LaGrange displayed a selection of local abalone shells, some dating from the 1960s.

The shell drawing was won by Jim Goldammer. The meeting was adjourned at 9 PM for coffee and conversation with the refreshments provided by Wes Farmer and Carole and Jules Hertz.

Nancy Schneider

### A Very Generous Donation to The San Diego Shell Club

The Club has just received a magnificent gift from Charter Member Billee Gerrodette. She has donated to the Club her extensive, well-curated, world-wide shell collection with representatives of the Panamic Province, shells from the California coast and her world-wide specimens. Some are also curated by family such as the Mitridae, Conidae, etc..

Billee has always said that she wants her shells to continue to be enjoyed by shell-enthusiasts. The shells from her collection will gradually be made available to Club members and friends at the Club's annual auctions where their sale will not only give pleasure to the buyers but raise money thus helping the Club continue its publication of *The Festivus* and donations to scientific organizations and student grants.

Our deep gratitude to Billee for this overwhelmingly generous gift.

### Additions to the Club Roster

Ervin, Edward, 104 Blanchard Rd., El Cajon, CA 92020;  
e-mail: EErvin@merkelinc.com

Barney, Winston, 2801 Clary, Fort Worth, TX 76111-4326;  
e-mail: wbarney@spindle.net

### New Book Arrival

A Review of Northwest Pacific Epitoniids

by Taisei Nakayama

(Monograph of Marine Mollusca No.6)

ISSN 0162-8321

\$75.00 plus \$3.00 domestic US mailing cost

A comprehensive review of all known epitoniids found in Japan and surrounding areas. Many species are also found in the general Indo-Pacific region. Very well researched, it clarifies and resolves many taxonomic problems in this family. A must-have for people who have interest in this group. 102 pages text. 20 color plate. Softbound.

Announcement by Donald Dan

## PARASITIC EULIMID GASTROPODS IN ECHINODERMS OF THE ISLAS GALÁPAGOS, ECUADOR

JORGE I. SONNENHOLZNER<sup>1</sup> and LUIS A. MOLINA<sup>2</sup>

<sup>1</sup>Instituto de Investigaciones Oceanológicas. Universidad Autónoma de Baja California. Apdo. Postal #453, Km 107 Carretera Tijuana-Ensenada, Ensenada, Baja California, México

E-mail: jsonnenholzner@hotmail.com

<sup>2</sup>Fundación Charles Darwin, Av. 6 de Diciembre N36-109. Casilla #17-01-3891, Quito, Ecuador

E-mail: lmolina@fedarwin.org.ec

### Introduction

Although the taxonomy and distribution of echinoderms in the Islas Galápagos are well known (Maluf, 1988, 1991), their biological interactions (i.e. parasitism) are not, seeing that echinoderms are intensively parasitized by eulimid gastropods (Pearse & Cameron, 1991). Little has been written about the eastern Pacific eulimid species (Skoglund, 2004). The studies on Eulimidae in the Islas Galápagos have primarily involved species description and taxonomy (i.e. Strong & Hertlein, 1939; Finet, 1985; Warén et al., 1994; Skoglund, 2002), but little is known of its ecology. As echinoderms are important components of marine communities, we provide further information on the host-parasite relationship that occurs along the southeastern and western regions of Islas Galápagos, Ecuador.

### Material and methods

Echinoderms and parasites were field-collected at 23 sites of six islands and two regions (a mixed cold-warm southeastern region and a cold western region) from March 2002 through April 2004. Samplings were done in early morning (0800–1000 hr) in sheltered shallow shores (0–8 m water depth) with low-medium hydrodynamics and a steep slope with compact large and medium-size rocks, pockets of sand and pebbles and brown and green algae. All specimens were meticulously examined, in addition urchins were shaken in a plastic-bag with brackish water. Afterwards the residue on the bottom of the plastic-bag was searched for eulimid gastropods. Urchins that were

parasitized by *Pelseneeria* had their gonads dissected to obtain qualitative and quantitative measures (e.g. color, weight) between specimens. The prevalence of infection, which is a measure of the numerical proportion of the infected individuals within the host population was determined and expressed as a percentage.

### Results

In this study two families of aspidochirote holothurians and a cidaroid sea urchin species were examined. The holothurian families were Holothuriidae and Stichopodidae with four species *Holothuria portovallartensis*, *H. theeli*, *Stichopus fuscus* and *S. horrens*; and the sea urchin *Encidaris galapagensis*.

#### Holothurians

A total of 3540 holothurians were field-collected along the southeastern and western regions of the Archipelago. *Holothuria portovallartensis* (n = 1557) and *Holothuria theeli* (n = 983) were examined. Both species were infected by the same gastropod parasite *Balcis panamensis* (Figure 1). The prevalence of infection in the holothurians *H. portavallartensis* and *H. theeli* were high, 95% and 79% respectively and the maximum number of parasites (adult and juvenile) in the same host was eight and six respectively. In *H. portovallartensis* the parasites were attached on their body wall, but preferentially located at the anterior side (47%) of the dorsal area (56%). But in *H. theeli* the parasites were located at the posterior side (68%) of the dorsal area (87%) and some parasites were deeply buried in the host skin with its proboscis inserted into the host. The holothurians *Stichopus fuscus* (n = 850) and *S. horrens* (n = 150) shared the same parasite



Figures Figure 1 (left). *Balcis panamensis*, 8.5 mm, at Islas Santa Cruz and Fernandina, intertidal rocky shore, host: *Holothuria theeli* and *H. portovallartensis*; Figure 2 (above) *Melanella falcata*, 8.0 mm at (Islas Fernandina, Isabela Oeste and Santa Cruz, by diving in 45 ft in shell debris from around rocks, host: *Stichopus fuscus* and *S. horrens*.

species *Melanella falcata* (Figure 2) and showed a low prevalence of infestation. Parasites were located on the hosts around their oral ring.

#### *Eucidaris galapagensis*

A total of 1855 specimens of *Eucidaris galapagensis* were examined. *Eucidaris galapagensis* (n = 925) was mainly affected by *Sabinella shaskyi* (Figure 3) where their infestation was high at 86% and the maximum number of parasites in the same host was 63 (between adult and juvenile parasites) and seven on the same spine. Between 25% and 42% of the host spines were affected. *Eucidaris galapagensis* (n = 930) had another parasite, *Pelseneeria* sp. (Figure 4), which crawled freely on

the host test and was commonly found attached in but not on or inside their spines as pairs on their gonopores as found in *Sabinella shaskyi*. *Pelseneeria* affected the gonads of the host in weight and color. The infestation reached high percentage values (95%) and the maximum number of parasites in the same host was five (adult parasites only).

#### **Discussion**

The results of this study suggest that *Balcis panamensis*, *Melanella falcata* and *Sabinella shaskyi* are widely distributed in the southeastern and western regions of the Islas Galápagos, while *Pelseneeria* sp. is apparently restricted to the southeastern region



Figure 3 *Sabinella shaskyi*, 3.5 mm, at Islas Seymour, Santiago and San Cristóbal in 5–20 ft., host: *E. galapagensis*.

only. This distribution probably may be explained by the different oceanographic fingerprint conditions that exist around the Archipelago (Edgar *et al.*, 2002). These thermal conditions can act as a reproductive strategy (Warén, 1983; Finet, 1984). *Balcis panamensis* and *Melanella falcata* are parasites that share the different host species *Holothuria portovallartensis* and *H. theeli*. As mentioned by Warén (1983), those parasites are not specific for a single host. However, several species of *Sabinella* are known to parasitize cidaroid sea urchins only (Warén, 1984; Warén & Moolenbeek, 1989; Warén & Mifsud, 1990). Therefore, *Sabinella shaskyi* has a high degree of host specificity, as found in *Eucidaris galapagensis* (Warén, 1983, 1992).

Lessios *et al.* (1999) resurrected the name *Eucidaris galapagensis* at the Galápagos for *E. thouarsii* from mainland Ecuador where there were morphologic and genetic variations based on size and mitochondrial DNA evidence, respectively; but both species are apparently parasitized by the same

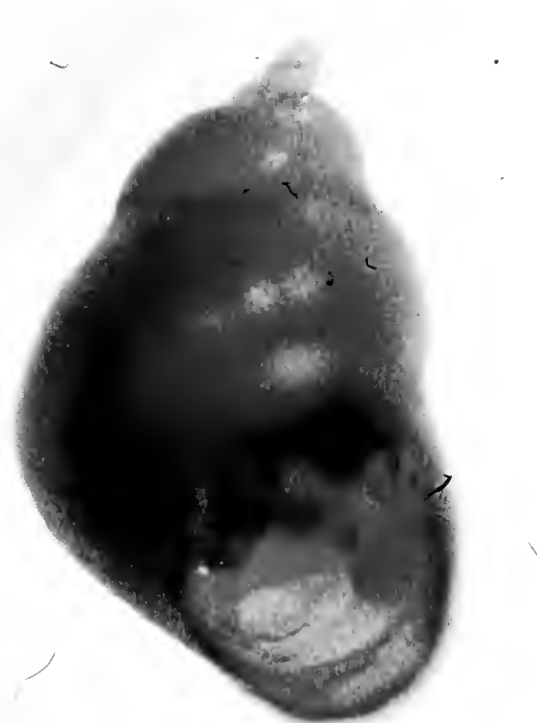


Figure 4. *Pelseneeria* sp., 2.0 mm, at Isla Santiago in 5–10 ft., host: *E. galapagensis*. Photos: L.A. Molina

gastropod, *Sabinella shaskyi* (Warén, 1992). Although the marine mollusks of the Islas Galápagos do not show high speciation phenomena, several aspects are interesting from a biogeographic and evolutionary perspective (Finet, 1994). It can therefore, probably also be assumed that *Sabinella* species from the Islas Galápagos and along the Panamic Province follow the same allopatric pattern of speciation by geographical barriers as found in *Eucidaris* (Warén, 1992; Lessios *et al.*, 1999).

The differences in position on the host may be caused by parasitism on different organs (Morton, 1979). The proboscis of *Balcis panamensis* and *Melanella falcata* can penetrate tissues of their holothurian hosts to suck their body fluid (Hoskin & Warén, 1983). *Sabinella shaskyi* creates a hollowed space in the tip of the host spines (see Metz, 1994, figs. 2, 3) causing sublethal damage, and *Pelseneeria* sp. lives on cidaroid sea urchins introducing their proboscis through the gonopores, reducing their reproductive capacity. In light of this, it is seen that



parasitism commonly causes reduced fecundity, lower metabolism, and decreases the host's ability to assimilate food items or respiration (Brand & Muñoz-Ley, 1980; Warén, 1983; Jangoux, 1990). Much more work is needed to fully understand the predator/prey relationships between eulimids on holothurians and sea urchins.

### Acknowledgments

We thank Dr. Anders Warén for the sample identification and the staff of the Galápagos National Park and the Charles Darwin Research Station, Islas Galápagos, Ecuador, for making working facilities available to us during this study. OEA/LASPAU supported the field study and provided financial assistance.

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## SPEAKING OF BOOKS

*Land Snails of British Columbia*

By: Robert G. Forsyth, softbound.

Price: \$25.95 US plus shipping and handling.

Order from: Royal BC Museum, 675 Belleville Street,  
Victoria, British Columbia, Canada V8W 9W2 or

e-mail: [shop@royalbcmuseum.bc.ca](mailto:shop@royalbcmuseum.bc.ca)

This new 188 page handbook by Robert Forsyth details the 92 known species of land snails and slugs of British Columbia (BC). It is a field guide written primarily for non-specialists, but it can be a valuable reference source for professionals as well. It includes an introduction, an extensive checklist, and a reference and bibliography section. In addition, there is a helpful glossary of terms and a species index.

The rather lengthy introduction covers many aspects of the natural history of the snails and slugs of BC in a concise and interesting manner. Subjects such as habitats, reproduction, diet, movement, faunal assemblages and defense are discussed. Adequate black and white photographs illustrate the sequence of slug courtship, slug eggs and the ventral line marking the site of autotomy of a tail-dropping slug. This section also devotes several pages to the description of shell characters, illustrated with good line drawings.

The checklist begins with a five page, hierarchal, taxonomic listing beginning with the two pulmonate "suborders" extant in BC: Acteophila and Stylommatophora. The numerous families of the Stylommatophora are arranged systematically, with their respective subgenera, genera and species listed alphabetically. For simplification, certain intermediate categories such as "infraorder" are omitted (as are clades and any informal taxa). This listing is followed by several pages of useful, and easy to use, dichotomous keys to the genera. Then, the ninety-two individual species accounts comprise the bulk of the work. Each account is about a page and a half in length and, after the binomial and common names and synonyms, divided into sections titled description, distribution, natural history, etymology, remarks and selected references (i.e. virtually everything known about the species). The taxonomy mostly follows recent European authors, such

as Falkner et al. (2002), and "melds recent advances ..... with the long established classifications of Pilsbry (1939-1948), Vaught (1989) and others." Most of the common names are from Turgeon et al. (1998). Line drawings, or B&W photographs, illustrate each species. These are mostly good in quality (many are by the author); however, a few of the photos did not print well. In addition, there are 33 very good, clear, color photographs of the larger species (by Kristiina Ovaska).

In my view, *Land Snails of British Columbia* is well-written, easy to understand, and easy to use. It is fully illustrated, well-referenced, and, for a handbook, very comprehensive in scope. The only other major source of information on this subject is Pilsbry's (1939-1948) extensive monograph series covering all of Canada and the U.S. I would prefer that the title of the book was *Land Snails and Slugs* of BC since over a fourth of the species are slugs. In addition, two-thirds of the color photographs are of the (often) rather attractive, behaviorally interesting, and "jazzily named" slug species, such as the "Scarletback Taildropper" and the "Warty Jumping-slug." Title aside, I highly recommend this nicely done handbook to anyone with an interest in land mollusks, or the natural history of British Columbia.

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Lance Gilbertson

## AMS/WSM MEET AT ASILOMAR

ROLAND C. ANDERSON

The Seattle Aquarium, 1483 Alaskan Way, Seattle, Washington 98101, USA  
 E-mail: andersrc@seattle.gov

The 38<sup>th</sup> annual meeting of the Western Society of Malacologists and 71<sup>st</sup> meeting of the American Malacological Society were held jointly at the Asilomar Conference Center in Pacific Grove, CA on 26-30 June 2005. Asilomar was used several times previously for meetings of both organizations and it was a pleasure to return there.

Asilomar is located on the ocean just south of Monterey and next to the renowned Pebble Beach golf course. It was originally built as a YMCA facility in 1912 and transferred to the California state parks system in 1956, which currently runs it. The original buildings were designed by the famous architect Julia Morgan (1872-1957) and her style has been maintained in modern buildings there also (Figure 1).

The conference had three major symposia: Gastropod Mating Systems, convened by Janet Leonard; From Development to Extinction, organized by Laurie Anderson and Audrey Aronowsky; and Pacific Island Land Snail Diversity, planned by Diarmaid O'Foighil.

It was interesting to hear the almost x-rated talks by Janet Leonard and her students about the mating habits of banana slugs! Mark Denny of Hopkins Marine Station gave the keynote talk on the mechanics of what it takes to live in the wave-washed intertidal zone.

As usual in any conference such as this, it is difficult to decide what talks to attend when there are concurrent sessions. As chair of the AMS student committee I was obligated to attend the student talks. I was very pleased with the quality of the work done this year by the students and their presentation skills. My committee and I awarded the Connie Boone Award for best student talk to Paul Bourdeau, who talked about the defenses used against predators by three species of



Figure 1. Main building at entrance to the Asilomar Conference Center.

### *Nucella.*

Also as usual in such a conference some speakers and talks stand out. Carole Hickman and Mike Hadfield gave wonderful talks on island biogeography. And having watched Janet Voight give talks at these meetings for nearly 20 years, since she was a student, I can attest she just keeps getting better like a fine wine. This year she spoke about lowering wood to the ocean's bottom nearly three kilometers deep and retrieving it a year later. She found unexpected diversity, six new species of wood boring bivalves had colonized the wood. As president of both the WSM and AMS next year, I am organizing the meeting in Seattle at the University of Washington, to be held 29 July to 3 August. Symposia are being planned on cephalopod behavior, on chitons and on nudibranchs.



# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
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## PROGRAM

### COME TO THE SEPTEMBER PARTY

. Saturday September 10<sup>th</sup> beginning at 4:30PM

(There is no regular meeting this month.)

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting August 18, 2005

The meeting was called to order at 7:45 p.m. by President Jules Hertz. The minutes of the previous meeting were approved as published in *The Festivus*. President Hertz announced that this was to be the last meeting of the summer, and reminded everyone of the September Party at the home of Larry Catarius on Saturday, September 10<sup>th</sup>. We will have the opportunity of viewing his collection, a potluck dinner will be served, and wine and soft drinks will be provided by the Club.

President Hertz then announced the recent donations of two shell collections: the Billee Gerrodette Collection and the Twila Bratcher Collection [see Col. 2, this page]. In addition, Beatrice Burch donated \$50 to *The Festivus*.

Vice President John LaGrange announced that upcoming speakers will be: Bob Yin, in October; Hank Chaney, in November; and Richard Herrmann at the Christmas Party.

Vice President LaGrange then introduced the evening's speaker, Carol Skoglund, who talked on night shell collecting in Panama during the 1970s. Carol made six trips to Panama from 1972 to 1985. Intertidal collecting of shells at extreme low tide was her primary purpose, during the spring tides of March. Kobbe Beach and Venado Island provided what she was looking for. She found that collecting by lantern at night revealed mollusks unseen by day. Many finds were photographed as slides and enjoyed by the audience. The frilly periostracum of one of the collected mollusks, *Cymatium tigrinum*, was preserved by being dipped in a solution of equal amounts of rubbing alcohol and glycerin. Because of her interest in the Panamic Province, Carol compared what she found in Panama with what could be found in the northern Gulf of California, her "stomping ground."

The Shell Drawing was won by Jules Hertz. The meeting was adjourned to the Coffee Table at 8:30 p.m., with cookies contributed by Ron Deems and Silvana Vollero. Bargain \$5 SDSC t-shirts were being sold in the back of the room.

Nancy Schneider

### A Second Magnificent Donation to The San Diego Shell Club

Club member Twila Bratcher-Critchlow, author of *Living Terebras of the World* and many scientific papers, has very generously donated her extensive world-wide shell collection to the Club.

Twila, often with her sister Billee, has dived in many areas of the world and her interest in shells resulted in her well-curated collection of mostly self-collected material. [Twila's *Terebra* collection was given to the Natural History Museum of Los Angeles County as research (voucher) material after publication of her (and Walter Cernohorsky) book].

Material in Twila's collection will gradually be made available at Club auctions and its proceeds will greatly help in sustaining the publication of *The Festivus* and the Club's donations to scientific organizations.

The Club is deeply grateful to Twila for this extraordinary gift.

### Shell cabinet available

A large shell cabinet with adjustable shelves is now available to an interested member or friend of the Club. This cabinet formerly housed part of the Billee Gerrodette Collection. [Two other cabinets, one formerly belonging to Twila and the other to Billee have already been "adopted."]

This large, well-made cabinet of heavy, walnut-stained plywood is waiting for a new owner. The cabinet is divided into two sections, each with its own door. It is 48" wide x 56" high x 21" deep and has many shelves on each side. It is available for a donation to the Club and it is currently being held at the home of John LaGrange.

To view the cabinet and for further information, please contact John at 858-755-7215.

### Changes of Address

Critchlow, Twila and Tom, 7544 La Jolla Blvd. #T15, La Jolla, CA 92037

Gerrodette, Billee and George, 939 Coast Blvd. #15H, La Jolla, CA 92037.

LaGrange, John [e-mail change]: john.lagrange@gmail.com

## *HARPA GRACILIS* BRODERIP & SOWERBY FOUND ALIVE AT ÎLE CLIPPERTON [French possession]

KIRSTIE L. KAISER<sup>1</sup>

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road  
Santa Barbara, California 93105, USA  
E-mail: [klkaiser@pvnet.com.mx](mailto:klkaiser@pvnet.com.mx)

*Harpa gracilis* Broderip & Sowerby, 1829, was first reported at Île Clipperton, a French possession in the tropical eastern Pacific, by Hertlein & Strong (1960). Since then, additional reports of empty shells have been reported by Salvat & Ehrhardt (1970) and

Small (1994). On the recent Jean-Louis Etienne Clipperton Expedition, I was fortunate to find two live specimens of *H. gracilis* as well as several empty or partial shells. A photograph of the live animals is shown as Figure 1. These live specimens were found at dive



Figure 1. *Harpa gracilis* Broderip & Sowerby, 1829, 2 specimens, live at Île Clipperton. Photo: Stephane Hourdez.

---

<sup>1</sup> Mailing address: Paseo de las Conchas Chinas #115 Depto 4, Fracc. Conchas Chinas C.P. 48390, Puerto Vallarta, Jalisco, México

site 7 (ICF-007-05) at 10°19.219' N, 109°13.394' W (SW side) by SCUBA at 20-22 m on 20 January 2005 by fanning the fine, silty sand under turnable dead coral. Four empty shells were found under similar conditions.

This is the first report of live *H. gracilis* at Île Clipperton and is an indication that there is a sustaining population.

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1960. Gastropods from Clipperton Island. *The Veliger* 3(1): 13-16.
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1970. Mollusques de L'île Clipperton. *Bulletin du Muséum National d'Histoire Naturelle. Paris, series 2* 42(1): 223-231 (in French).
- SMALL, MICHAEL  
194. Clipperton '94: an initial report. *The Festivus* 26(7): 78-83, figs. 1-3.

## NEW PANAMIC RANGE EXTENSION FOR *MACRON AETHIOPS* (REEVE, 1847)

CHRISTOPHER C. BROWN

4575 N. Avenue Del Cazador, Tucson, Arizona, 85718

E-mail: flashcove@mindspring.com

On a recent vacation to Loreto, Baja California Sur, México, my wife and I took a day trip to Bahía Concepción which resulted in a new addition to our collection: *Macron aethiops*.

In reading about this species in Keen (1971), she states that it is "Common on the outer coast of Baja, rare in the Gulf of California." In Carol Skoglund's (2002) supplement to *The Festivus* the distribution was given from Playa San Ramon to 10 miles north of Cabo San Lucas by DuShane, 1989. This was extended in 1996 by Margaret Mulliner to Isla Danzante. Our find at Playa los Cocos in Bahía Concepción extends the northern range in the Gulf by approximately 90 miles. The 67 mm specimen was dead collected by my wife in two feet of water at the morning low tide.

#### Literature Cited

KEEN, A. MYRA

1971. *Sea Shells of Tropical West America*. 2<sup>nd</sup> edition, Stanford University Press, Stanford, CA xiv+ 1064 pp. [pp. 564-566], ca. 4000 figs.

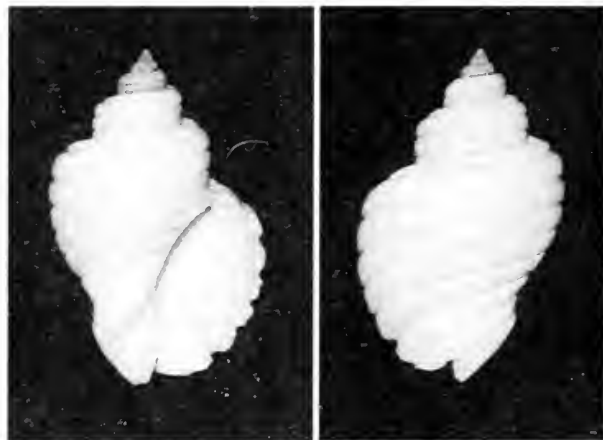


Figure 1. *Macron aethiops* (Reeve, 1847), 67 mm L, collected dead, Playa las Cocos, Bahía Concepción. June 2005.

SKOGLUND, CAROL

202. Panamic Province Mollusca Literature Additions and Changes from 1971 through 2001. III Gastropoda.xi-286 [pp. 127-128].

## CATALOG OF RECENT AND FOSSIL CYPRAEIDAE AND EOCYPRAEIDAE: 2000 THROUGH 2004

LINDSEY T. GROVES

Natural History Museum of Los Angeles County, Malacology Section  
900 Exposition Boulevard, Los Angeles, California, 90007, USA  
E-mail: lgroves@nhm.org

### Introduction

Groves (2000) compiled a lengthy catalog of cypraeid and eocypraeids described subsequent to Groves (1994). Herein is a list of taxa described since Groves (2000), taxa inadvertently omitted, and additional information received and/or determined after publication. Names introduced without descriptions are not included.

One-hundred and seventy-two taxa of cypraeids and eocypraeids are treated herein, of which 59 (one tribe, 3 genera, 15 species, and 40 subspecies) are Recent taxa and 113 (7 genera, 4 subgenera, 100 species, and 2 subspecies) are fossil taxa. Of the Recent taxa 57 were described as new, one was not included in Groves (2000) and one was not included in Schilder & Schilder (1971), Groves (1994), or Groves (2000). Of the fossil taxa 110 were described as new, two were not included in Groves (2000) and one was not included in Schilder & Schilder (1971), Groves (1994), or Groves (2000). Taxonomic allocations listed in the Remarks sections, unless cited otherwise, are the opinion of the author.

### Abbreviations

The following abbreviations are used herein for locality and/or type numbers: **CS** = Franz Schilder Collection, Zoological Museum of Natural History, Humboldt University, Berlin, Germany; **HNC** = Haus der Natur, Cismar, Germany; **HMB** = Humboldt Museum, Berlin, Germany; **HUJ** = Hebrew University, Jerusalem, Israel; **IGM** = Instituto de Geología UNAM, Ciudad Universitaria, México; **IHM** = Instituto de Historia Natural del Estado de Chiapas, Tuxtla Gutiérrez, Chiapas, México; **LACM** = Malacology Section, Natural History Museum of Los Angeles County, Los Angeles, California, USA; **LACMIP** = Invertebrate Paleontology Section, Natural History Museum of Los Angeles County,

Los Angeles, California, USA; **GIH** = Geological Institute of Hungary, Budapest, Hungary; **MNHN** = Muséum National d'Histoire Naturelle, Paris, France; **NM** = Natal Museum, Pietermaritzburg, Natal, South Africa; **RBCM** = Royal British Columbia Museum, Vancouver, British Columbia, Canada; **SAM** = South African Museum, Cape Town, South Africa; **SBMNH** = Santa Barbara Museum of Natural History, Santa Barbara, California, USA; **SGOPI** = Departamento de Paleontología de Invertebrados, Museo Nacional de Historia Natural, Santiago, Chile; **SMNS** = Staatliches Museum für Naturkunde, Stuttgart, Germany; **TM** = New Zealand Institute of Geological and Nuclear Sciences, Type Mollusca collection Wellington, New Zealand; **UBT** = Université de Bordeaux, Laboratoire de Recherches et Applications Géologiques, Talence, France; **UCMP** = University of California, Museum of Paleontology, Berkeley, California, USA; **WAM** = Western Australian Museum, Perth, Australia; **VM** = National Museum of Victoria, Melbourne, Victoria, Australia; **ZMB** = Zoologisches Museum Berlin, Germany.

### Acknowledgments

Many thanks to Richard E. Petit (North Myrtle Beach, South Carolina) for alerting the author to an obscure reference [Frebold, 1940]. Jim McLean and Ángel Valdés (LACM) kindly read the brief text. Dirk Fehse (Berlin, Germany) sent numerous reprints of pertinent papers and shared his astute opinions regarding taxonomic interpretations (especially those published in Dolin & Lozouet, 2004). Tom Darragh (VM), Luc Dolin (Civray-de-Touraine, France), Bill Liltved (South Africa), Felix Lorenz (Giessen, Germany), Chris Meyer (Florida Museum of Natural History, Gainesville, Florida), Fabio Moretzsohn (Texas A&M University, Corpus Christi, Texas), Bret Raines (Victorville,



California), and Francisco Vega (IGM) provided reprints and/or pertinent papers. Type collection access at SBMNH was granted by Henry W. Chaney.

### Recent Taxa Family Cypraeidae

*abrolhensis*, *Cribrarula exmouthensis* Lorenz, 2002:133-134, pl. 37, figs. 1-4.

**Type Locality:** Wallabi Id., Abrolhos Ids., Western Australia, Australia.

**Type Material:** Holotype WAM, 1 paratype in the collection of M. Beals (Inglewood, California, USA), 3 paratypes in collection of F. Lorenz (Giessen, Germany).

*admirabilis*, *Leporicypraea mappa* Lorenz, 2002:24-25, pl. 6, figs. 1-5.

**Type Locality:** Fakarawa, Tuamotu Archipelago, French Polynesia.

**Type Material:** Holotype MNHN, 14 paratypes in collection of F. Lorenz (Giessen, Germany).

*aenigma*, *Nesiocypraea* Lorenz, 2002:64-65, pl. 11, fig. 2, unnumbered fig. p. 184.

**Type Locality:** Exact locality unknown, off South Africa.

**Type Material:** Holotype NM no.V7041, 1 paratype in collection of L. Corfdir (current whereabouts unknown).

*alexhuberti*, *Nesiocypraea* Lorenz & Huber, 2000:494-496, figs. A13-A14 (middle fig.), pl. 128, figs. 1-5.

**Type Locality:** From 80-100 m between Thailand and Sumatra, Indonesia, southern Andaman Sea.

**Type Material:** Holotype and 2 paratypes in the collection of junior author F. Huber (Schwanenstadt, Austria).

**Remarks:** Due to the high commercial value of these specimens they were not deposited in a museum or university collection. However, access to the holotype is guaranteed to institutions and scientists by its owner (Lorenz & Huber, 2000). Ride (2000) ICZN Article 72.10 states that name-bearing types "are to be held in trust for science by the persons responsible for their safe keeping." Whether or not holotypes retained in private collections violates this article is debatable.

*aliguayensis*, *Erronea pulchella* Heesvelde & Deprez, 2001:43-47, pl. 2, fig. 1, figs. 2-5.

**Type Locality:** From 130-250 m, Aliguay Id., near Dipolog, Zamboanga del Norte Prov., Mindanao, Philippines.

**Type Material:** Holotype MNHN, 4 paratypes in the collection of F. Lorenz (Giessen, Germany), 2 paratypes in the collection of J. Deprez (St. Gillis-Waas, Belgium), and 3 paratypes in the collection of J. van Heesvelde (Gent/Wondelgem, Belgium).

*aliwalensis*, *Leporicypraea mappa* Lorenz, 2002:25-26, pl. 7, figs. 3-4.

**Type Locality:** Aliwal Shoal, Natal, South Africa.

**Type Material:** Holotype MNHN, 6 paratypes in the collection of F. Lorenz (Giessen, Germany).

*australiensis*, *Cribrarula cribraria* Lorenz, 2002:131-132, pl. 35, figs. 1-8.

**Type Locality:** From 7-9 m, Shark Bay, Western Australia, Australia.

**Type Material:** Holotype HNC, 36 paratypes in collection of F. Lorenz (Giessen, Germany).

*bataviensis*, *Zoila ketyana* Lorenz & Morrison in Lorenz, 2001:37-38, figs. 20-21, pl. 26.

**Type Locality:** From 33 to 45 m, Abrolhos Id. Group, Western Australia, Australia.

**Type Material:** Holotype SAM, 2 paratypes in collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Zoila marginata ketyana* Raybaudi, 1978, by Groves & Weil (2003) and Wilson & Clarkson (2004).

**Bistolidini** Meyer, 2003:459.

**Type Genus:** *Bistolida* Cossmann, 1920.

*borzattii*, *Staphylaea (Nuclearia)* Bini, 1982:143-147, figs. 2a-d.

**Type Locality:** Cavite, Cavite Prov., Manila Bay, Luzon, Philippines (14°29'N, 120°54'E).

**Type Material:** Holotype currently in collection of G. Bini (Promano, Italy) [to be deposited in a public museum (Smriglio & others, 2002)].

**Remarks:** Aberrant form of *S. staphylaea* (Linné, 1758). This species was not included in Schilder & Schilder (1971), Groves (1994) or Groves (2000).

*boucheti*, *Notadusta* Lorenz, 2002:142-145, pl. 38, figs. 4-6.

**Type Locality:** From 415-510 m, off Fiji (16°45'S, 179°59'E).

**Type Material:** Holotype and 11 paratypes MNHN.

*brasilensis*, *Luria cinerea* Lorenz, 2002:35-38, pl. 9, figs. 3-8.

**Type Locality:** Off Recife, Pernambuco State, Brazil.

**Type Material:** Holotype MNHN, 1 paratype in HNC, 45 paratypes in collection of F. Lorenz (Giessen, Germany).

*brianoi*, *Bistolida stolidia* Lorenz, 2002:90-93, pl. 22, figs. 5-7.

**Type Locality:** Southeastern Madagascar.

**Type Material:** Holotype HNC, 3 paratypes in collection of F. Lorenz (Giessen, Germany).

*cavatoensis*, *Nesiocypraea* (*Austrasiatica*) *langfordi* Lorenz, 2002:72-74, pl. 12, figs. 4-6.

**Type Locality:** From 370-400 m, Vanuatu (20°20'S, 169°49'E).

**Type Material:** Holotype and 34 paratypes MNHN.

*chiapponii*, *Pustularia* Lorenz, 1999:17-19, unnumbered fig. on p. 17, fig. 4 (left image), fig. 5 (left photo), fig. 19.

**Type Locality:** Borogan, Samar Oriental Prov., Samar Id., Philippines.

**Type Material:** Holotype HNC, 3 paratypes in the collection of F. Lorenz (Giessen, Germany), 4 paratypes in the collection of M. Chiapponi (Lecco, Philippines).

**Remarks:** This species was not included in Groves (2000).

*colligata*, *Cypraeovula* Lorenz, 2002:54-56, pl. 17, figs. 9-10.

**Type Locality:** Mbotyi, Transkei, South Africa.

**Type Material:** Holotype HNC, 5 paratypes in collection of F. Lorenz (Giessen, Germany).

*consanguinea*, *Palmadusta* Blöcher & Lorenz, 2000:2-4, figs. 3-5.

**Type Locality:** Southern Madagascar, between Manambovo and Mandrare River deltas.

**Type Material:** Holotype SMNS no. ZI 30 466, 2 paratypes in the collection of M. Blöcher (Duisburg, Germany), 1 paratype in the collection of F. Lorenz (Giessen, Germany).

*Contradusta* Meyer, 2003:458-459.

**Type Species:** *Cypraea walkeri* Sowerby, 1832.

*Cryptocypraea* Meyer, 2003:458.

**Type Species:** *Cypraea dillwyni* Schilder, 1922.

*dani*, *Blasicrura* Beals, 2002:15-17, figs. 1-6.

**Type Locality:** From 60 to 150 m, Aligbay Id., off Dipolog, Zamboanga del Norte Prov., Mindanao, Philippines (8.42°N, 123.16°E).

**Type Material:** Holotype SBMNH no. 345731, 1 paratype in the collection of M. Brooks (Sutton Coalfield, England).

*dauphinensis*, *Erosaria citrina* Lorenz, 2002:148-150, pl. 40, figs. 5-7.

**Type Locality:** Near Ft. Dauphin, southeast Madagascar.

**Type Material:** Holotype MNHN, 49 paratypes in collection of F. Lorenz (Giessen, Germany).

*debruini*, *Cypraeovula coronata* Lorenz, 2002:46-50, pl. 13, figs. 1-3.

**Type Locality:** Hout Bay, Cape Prov., South Africa.

**Type Material:** Holotype HNC, 1 paratype MNHN, 1 paratype WAM, 68 paratypes in collection of F. Lorenz (Giessen, Germany).

*deforgesi*, *Nesiocypraea* Lorenz, 2002:66-67, pl. 11, fig. 1.

**Type Locality:** From 416 m, near Fiji (16°45'S, 179°59'E).

**Type Material:** Holotype MNHN.

*elatensis*, *Blasicrura teres* Heiman & Mienis, 2002:11-14, figs. 2-6.

**Type Locality:** Elat, Gulf of Aqaba, Israel.

**Type Material:** Holotype HUJ no. 40830, 5 paratypes in the collection of E.L. Heiman (Rehovot, Israel).

**Remarks:** Considered a junior synonym of *Blasicrura teres* (Gmelin, 1791) by Groves & Weil (2003).

*francescoi*, *Cribrarula esontropia* Lorenz, 2002:127-129, pl. 34, figs. 1-7.

**Type Locality:** Ft. Dauphin, southeast Madagascar.

**Type Material:** Holotype MNHN, 3 paratypes in collection of M. Beals (Inglewood, California, USA), 45 paratypes in collection of F. Lorenz (Giessen, Germany).

*garciai*, *Cribrarula* Lorenz & Raines, 2001:27-29, pl. 1.

**Type Locality:** At 30 m, near Hanga Roa, Easter Island, eastern Pacific.

**Type Material:** Holotype LACM no. 2898, 1 paratype in the collection of F. Lorenz (Giessen, Germany).

*gilvella*, *Luria* Lorenz, 2002:38-42, pl. 10, figs. 1-8.

**Type Locality:** R-Buoy Lagoon Pinacle, Kwajalein Atoll, Ralik Chain, Marshall Ids.

**Type Material:** Holotype MNHN, 1 paratype HNC, 148 paratypes in the collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Luria isabella* (Linné, 1758) by Groves & Weil (2003).

*gravida*, *Cribrarula* Moretzsohn, 2002:2-13, figs. 1-6, 22 [radula], 26 [upper left fig.], 28.

**Type Locality:** From 18 m depth, south side Fish Rock, 2 km SE of Smoky Cape, New South Wales, Australia (30°56.4'S, 153°5.9'E).

**Type Material:** Holotype AMS no. C.91000.

*grohorum*, *Cypraeovula fuscudentata* Lorenz, 2002:43-44, pl. 15, figs. 1-4.

**Type Locality:** Buffels Bay, Cape Prov., South Africa.

**Type Material:** Holotype MNHN, 1 paratype in collection of K. Groh (Germany), 1 paratype in WAM, 1 paratype in HNC, 36 paratypes in collection of F. Lorenz (Giessen, Germany).

*guidoi*, *Notadnsta katsuae* Lorenz, 2002:145-147, pl. 39, figs. 2-4.

**Type Locality:** From 51 m, off New Caledonia (21°50'S, 166°40'E).

**Type Material:** Holotype and 21 paratypes in MNHN.

*immemani*, *Cypraeovula* Liltved, 2001:225-229, figs. 77a-77c.

**Type Locality:** From 88-92 m, off Port Grosvenor, northern Cape Prov., South Africa (31°24'S, 30°01'E).

**Type Material:** Holotype NM no. V8290-T1751, 1 paratype NM no. V8291-T1752, 2 paratypes SAM nos. A55400-A55500.

*janae*, *Blasicrura (Talostolida) teres* Lorenz, 2002:108-109, pl. 24, figs. 1-5.

**Type Locality:** Taïarapu, Tahiti, Society Ids., French Polynesia.

**Type Material:** Holotype MNHN, 1 paratype WAM, 75 paratypes in collection of F. Lorenz (Giessen, Germany).

*johnsonorum*, *Palmadusta* Lorenz, 2002:85-89, pl. 21, figs. 8-10.

**Type Locality:** Kwajalein Atoll, Ralik Chain, Marshall Ids.

**Type Material:** Holotype MNHN, 11 paratypes in collection of F. Lorenz (Giessen, Germany).

*latebrosa*, *Cypraeovula castanea* Swarts & Liltved in Liltved, 2000:222-224, figs. 107b-107c.

**Type Locality:** From 70-80 m, off Jeffreys Bay, Cape Prov., South Africa (34°03'S, 24°55'E).

**Type Material:** Holotype NM no. V7613-T1722, 2 paratypes in collection of S. Swarts (South Africa), 1 paratype in collection of M. Hart (Auckland, New Zealand).

*latistoma*, *Zoila rosselli* Lorenz, 2002:11-14, pl. 1, figs. 5-6, 8.

**Type Locality:** In 34 m. Bremer Bay, Albany, Western Australia, Australia.

**Type Material:** Holotype WAM, 1 paratype MNHN, 12 paratypes in collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Zoila rosselli* Cotton, 1948, by Wilson & Clarkson (2004).

*magnifica*, *Cribrarula exmouthensis* Lorenz, 2002:132-133, pl. 36, figs. 1-4.

**Type Locality:** Broome, Western Australia, Australia.

**Type Material:** Holotype WAM, 8 paratypes in collection of F. Lorenz (Giessen, Germany).

*marquesana*, *Purpuradusta fimbriata* Lorenz, 2002:82-84, pl. 21, figs. 11-15, unnumbered fig. p. 204.

**Type Locality:** Taïohae Bay, Nuku Hiva, Marquesas Archipelago, French Polynesia.

**Type Material:** Holotype MNHN, 1 paratype HNC, 28 paratypes in collection of F. Lorenz (Giessen, Germany).

*martybealsi*, *Mauritia maculifera* Lorenz, 2002:17-18, pl. 3, figs. 3-7.

**Type Locality:** Taïohae Bay, Nuku Hiva, Marquesas Archipelago, French Polynesia.

**Type Material:** Holotype MNHN, 1 paratype in collection of M. Beals (Inglewood, California, USA), 12 paratypes in collection of F. Lorenz (Giessen, Germany).

*mundula*, *Mauritia scurra* Lorenz, 2002:21-23, pl. 4, figs. 6-7.

**Type Locality:** Taïarapu, Tahiti, Society Ids., French Polynesia.

**Type Material:** Holotype MNHN, 2 paratypes WAM, 1 paratype HNC, 73 paratypes in collection of F. Lorenz (Giessen, Germany).

*natalensis*, *Blasicrura teres* Heiman & Mienis, 2002:14-16, figs. 10-20.

**Type Locality:** Scottsburg, Natal, South Africa.

**Type Material:** Holotype NM no. V9987/T1879, 5 paratypes in the collection of E.L. Heiman (Rehovot, Israel).

**Remarks:** Considered a junior synonym of *Blasicrura teres* (Gmelin, 1791) by Groves & Weil (2003).

*neocaledonica*, *Nesiocypraea teramachii* Lorenz, 2002:68-70, pl. 11, figs. 6-7.

**Type Locality:** From 379-391 m, Banc Jumeau Ouest, New Caledonia.

**Type Material:** Holotype and 26 paratypes MNHN, 7 paratypes in collection of F. Lorenz (Giessen, Germany).

*nigromaculata*, *Lyncina porteri* Lorenz, 2002:32-33, pl. 8, figs. 1-6.

**Type Locality:** From 235-250 m, off southern New Caledonia (23°41'S, 168°01'E).

**Type Material:** Holotype and 21 paratypes MNHN, 3 paratypes in collection of J. Deprez, 1 paratype in collection of F. Lorenz (Giessen, Germany).

*Palmulacypraea* Meyer, 2003:458.

**Type Species:** *Notadusta katsuae* (Kuroda, 1960).

*panamensis*, *Blasicrura (Talostolida) pellucens* Lorenz, 2002:106-107, pl. 26, figs. 6-9.

**Type Locality:** Isla Cébaco, Veraguas Prov., Panamá.

**Type Material:** Holotype MNHN, 9 paratypes in collection of F. Lorenz (Giessen, Germany).

*peelae*, *Cypraeovula connelli* Lorenz, 2002:53-54, fig. 9, pl. 16, fig. 10, unnumbered fig. p. 194.

**Type Locality:** Off Durban, Natal, South Africa.

**Type Material:** Holotype HNC, 1 paratype in collection of M. Beals (Inglewood, California, USA), 3 paratypes in collection of F. Lorenz (Giessen, Germany).

*pervelata*, *Erronea bregeriana* Lorenz, 2002:74-76, pl. 20, figs. 10-12.

**Type Locality:** Marau Sound, Guadalcanal, Solomon Ids.

**Type Material:** Holotype MNHN, 11 paratypes in collection of F. Lorenz (Giessen, Germany).

*petilirostris*, *Umbilia* Darragh, 2002:366-367, figs. 13A-C, 15D, F-G.

**Type Locality:** From 252-264 m, Capricorn Channel, off Lady Musgrave Id., Queensland, Australia.

**Type Material:** Holotype VM no. F86962, 2 paratypes nos. VM F86963, F86967.

**Remarks:** Considered a junior synonym of *Umbilia capricornica* Lorenz, 1989, by Wilson & Clarkson (2004).

*polyphemus*, *Nesiocypraea teramachii* Lorenz, 2002:70-71, pl. 11, figs. 4-5.



**Type Locality:** From 200 m. off Punta Egaño, Cebu, Cebu Prov., Philippines.

**Type Material:** Holotype MNHN, 11 paratypes in collection of F. Lorenz (Giessen, Germany).

*rasnasraniensis*, *Cypraea pantherina* Heiman & Mienis, 2001:7-9, pl. 1, figs. 1-4.

**Type Locality:** Ras Nasrani, 25 km north of Sharm-el-Sheikh, Sinai Peninsula, Strait of Tiran, Egypt.

**Type Material:** Holotype HUJ no. 7968, 6 paratypes in collection of E.L. Heiman (Rehovot, Israel).

**Remarks:** Considered a junior synonym of *Cypraea pantherina* Solander, 1786, by Groves & Weil (2003).

*rotnestensis*, *Cribrarula exmouthensis* Lorenz, 2002:134-140, pl. 37, figs. 5-10.

**Type Locality:** Rottnest Id., near Perth, Western Australia, Australia.

**Type Material:** Holotype WAM, 33 paratypes in collection of F. Lorenz (Giessen, Germany).

*samoensis*, *Erronea caurica* Lorenz, 2002:77-82, pl. 19, figs. 8-11.

**Type Locality:** Sataua, Savai'i Id., Western Samoa.

**Type Material:** Holotype MNHN, 79 paratypes in the collection of F. Lorenz (Giessen, Germany).

*satiata*, *Zoila rosselli* Lorenz, 2002:10-11, pl. 1, figs. 1-2, 7.

**Type Locality:** Point Quobba, Western Australia, Australia.

**Type Material:** Holotype WAM, 1 paratype MNHN, 20 paratypes in collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Zoila rosselli* Cotton, 1948, by Wilson & Clarkson (2004).

*scindata*, *Mauritia maculifera* Lorenz, 2002:18-20, pl. 4, figs. 1-3.

**Type Locality:** From 1 m, Taiarapu, Tahiti, Society Ids., French Polynesia.

**Type Material:** Holotype MNHN, 1 paratype WAM, 1 paratype HNC, 1 paratype in collection of R. Bridges (Phoenix, Arizona, USA), 33 paratypes in the collection of F. Lorenz (Giessen, Germany).

*sphaerica*, *Cypraeovula fuscudentata* Lorenz, 2002:44-46, pl. 15, figs. 7-10.

**Type Locality:** Off Cape Agulhas, Cape Prov., South Africa.

**Type Material:** Holotype HNC, 6 paratypes in collection of F. Lorenz (Giessen, Germany).

*suprasinum*, *Zoila decipiens* Lorenz, 2002:7-9, pl. 2, figs. 1-2.

**Type Locality:** Onslow, Western Australia, Australia.

**Type Material:** Holotype WAM, 1 paratype MNHN, 1 paratype HNC, 7 paratypes in collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Zoila decipiens*

(Smith, 1880) by Wilson & Clarkson (2004).

*thalamega*, *Zoila jeaniana* Lorenz, 2002:14-16, pl. 2, figs. 4-6.

**Type Locality:** From 28 to 38 m, Kalbarri, Western Australia, Australia.

**Type Material:** Holotype WAM, 1 paratype in collection of J. Deprez (St. Gillis-Waas, Belgium), 1 paratype in collection of F. Lorenz (Giessen, Germany).

**Remarks:** Considered a junior synonym of *Zoila jeaniana* Cate, 1968, by Wilson & Clarkson (2004).

*transkeiana*, *Cypraeovula alfredensis* Lorenz, 2002:50-53, pl. 13, figs. 12-13, unnumbered fig. p. 188.

**Type Locality:** Fullers Bay, East London, Cape Prov., South Africa.

**Type Material:** Holotype HNC, 49 paratypes in collection of F. Lorenz (Giessen, Germany).

*violacincta*, *Blasicrura (Talostolida) subteres* Lorenz, 2002:110-113, pl. 24, figs. 6-7.

**Type Locality:** Taiaapu, Tahiti, Society Ids., French Polynesia.

**Type Material:** Holotype MNHN, 1 paratype HNC, 31 paratypes in collection of F. Lorenz (Giessen, Germany).

*wattsii*, *Pustularia manieusis* Lorenz, 2000:19-22, pl. 1, figs. 5-8, pl. 2, figs 3-4, 6.

**Type Locality:** North of Maui, Hawai'i.

**Type Material:** Holotype and 1 paratype MNHN, 9 paratypes in collection of F. Lorenz (Giessen, Germany), 1 paratype in collection of D. Woodman (Hawai'i), 1 paratype in collection of D. Watts (Hawai'i), 1 paratype in collection of M. Chiapponi (Lecco, Philippines), 1 paratype in collection of D. Corley (New York, USA).

**Remarks:** Considered a junior synonym of *Pustularia mauensis* (Burgess, 1967) by Groves & Weil (2003).

### Fossil Taxa

#### Family Cypraeidae

*abbreviata*, *Plaziatia* Dolin & Lozouet, 2004:55-56, pl. 25, figs. 1a-1c, 2-3.

**Type Locality:** Lower Miocene (Burdigalian). St. Jean-de-Marsacq (Lahitet), Landes Dept., France.

**Type Material:** Holotype and paratype MHNH.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*abessensis*, *Plaziatia* Dolin & Lozouet, 2004:56, pl. 23, figs. 5a-5c.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Abesse "Château"), Landes Dep't., France.

**Type Material:** Holotype MHNH.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*amae*, *Austrocypraea* Fehse & Kendrick, 2000:95-101, figs .



1A-L, 2A-J.

**Type Locality:** Late Pliocene, Roe Calcarene. From foundation holes of Hampton Microwave tower, Roe Plains, Madura District, Eucla Basin, Western Australia (31°57'57"S, 127°34'45"E).

**Type Material:** Holotype WAM no. 69.495, 6 paratypes HMB no. 102445-102450, 14 paratypes WAM nos. 71.331a, 80.67a-c, g, 80.145a-j.

*amandula*, *Plaziatia* Dolin & Lozouet, 2004:56-57, pl. 24, figs. 3a-3c, 4.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Abesse "Château"), Landes Dept., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894. Specimen in fig. 4 may be *Z. abessensis* (Dolin & Lozouet, 2004).

*amoenacea*, *Praerosaria* Dolin & Lozouet, 2004:66, pl. 30, figs. 1a-1c, 2-3.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*antisitia*, *Ransonia* Dolin & Lozouet, 2004:32-33, pl. 15, figs. 5a-5c, 6.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*aspenae*, *Siphocypraea* (*Pahayokea*) Petuch, 2004:277, pl. 82, figs. G-H.

**Type Locality:** Pleistocene (middle Calabrian), Bee Branch Member, Caloosahatchee Formation, Okeechobee Group, Brantley Pit, south of Arcadia, DeSoto Co., Florida.

**Type Material:** Holotype AMNH no. 50660, 3 paratypes in research collection of E.J. Petuch (Lake Worth, Florida).

*aturensis*, *Zonarina* Dolin & Lozouet, 2004:40, pl. 17, figs. 6a-6c, 7.

**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mañot), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*bairdi*, *Akleistostoma* Petuch, 2004:273, pl. 71, figs. E-F.

**Type Locality:** Pliocene (Piacenzian), Fruitville Member (Sarasota Unit 3), Tamiami Formation, Okeechobee Group. From dredgings along the Kissimmee River at Ft. Basinger, Highlands Co., Florida.

**Type Material:** Holotype AMNH no. 50655, 3 paratypes in

research collection of E.J. Petuch (Lake Worth, Florida).

*barcamorpha*, *Prozonarina* Dolin & Lozouet, 2004:49, pl. 21, figs. 4, 5a-5c.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dept., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894. Specimen in fig. 4 may be *Z. mineurensis* (Dolin & Lozouet, 2004).

*basingerensis*, *Siphocypraea* (*Pahayokea*) Petuch, 2004:277-278, pl. 71, figs C-D.

**Type Locality:** Pliocene (Piacenzian), Fruitville Member (unit 3), upper Tamiami Formation, Okeechobee Group. Dredgings from the Kissimmee River, Ft. Basinger, Highlands Co., Florida, USA.

**Type Material:** Holotype AMNH no. 50661, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida).

*beardi*, *Bernaya* (*Bernaya*) Groves, 2004:47, figs. 6-9.

**Type Locality:** Upper Cretaceous (uppermost Santonian to lowermost Campanian), upper Haslam Formation, Nanaimo Group. Near Brannan Lake, Vancouver Island, British Columbia, Canada.

**Type Material:** Holotype RBCM no. EH2003.008.0001

*bezoyensis*, *Nucleolaria* Dolin & Lozouet, 2004:74, figs. 23a-23c, pl. 27, figs. 7a-7c, 8.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*biacuta*, *Praerosaria* Dolin & Lozouet, 2004:66-67, pl. 31, figs. 7a-7c, 8.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*boucheti*, *Cypraea* Dolin & Lozouet, 2004:18, figs. 2a-2c, pl. 7, figs. 1a-1c.

**Type Locality:** Lower Miocene (Burdigalian). Saucats (Le Peloua), Gironde Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Miohyalina* Schilder, 1932.

*brantleyi*, *Siphocypraea* (*Okeechobea*) Petuch, 2004:276, pl. 82, figs. A-B.

**Type Locality:** Pleistocene (middle Calabrian), Bee Branch Member, Caloosahatchee Formation, Okeechobee Group, Brantley Pit, south of Arcadia, De Soto Co., Florida, USA.

**Type Material:** Holotype AMNH no. 50659, 3 paratypes in research collection of E.J. Petuch (Lake Worth, Florida).

*brebioni*, *Schilderia* Dolin & Lozouet, 2004:41-42, pl. 20, figs. 1a-1c, 2.

**Type Locality:** Upper Miocene (Messinian). Brigné (Beugnon), Maine et Loire Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Junior synonym of *Schilderia andegavensis* (Defrance, 1826).

*cahuzaci*, *Luria* (*Tessellata*) Dolin & Lozouet, 2004:20, pl. 9, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype MNHN, paratype UBT no. 32.2.35.

**Remarks:** Valid species reassigned to the genus *Luria* s.s. Jousseume, 1884.

*camidoriun*, *Proadusta* Dolin & Lozouet, 2004:25-26, pl. 13, figs. 1a-1c, 2-3.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Cypraeorbis* Conrad, 1865. Specimen in fig. 3 may be an undescribed species.

*castiuea*, *Luria* (*Tessellata*) Dolin & Lozouet, 2004:21, pl. 9, figs. 3a-3b, 4.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Luria* s.s. Jousseume, 1884.

*charlenae*, *Praerosaria* Dolin & Lozouet, 2004:67, pl. 32, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*chattica*, *Luria* (*Tessellata*) Dolin & Lozouet, 2004:21, pl. 10, figs. 1a-1c.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Luria* s.s. Jousseume, 1884.

*chiapaseusis*, *Beruaya* (*Bernaya*) *media* Perrilliat, Avendaño, & Vega, 2003:43-44, 46, figs. 7-10.

**Type Locality:** Middle Eocene, San Juan Formation. Southeast of Tuxtla Gutiérrez, Chiapas, México (loc. IHN 1005).

**Type Material:** Holotype IHN no. 5459, paratype IGM no. 7599.

*cingulata*, *Lyncina* Dolin & Lozouet, 2004:11-12, pl. 6, figs. 1a-1c.

**Type Locality:** Lower Miocene (Burdigalian). Uzeste (Moulin de Ganachot), Gironde Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*coseli*, *Ransouia* Dolin & Lozouet, 2004:33, pl. 14, figs. 2a-2c, 3.

**Type Locality:** Upper Oligocene (Chatian). St. Etienne d'Orthe (Ruisseau Verdun), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*distorta*, *Proadusta* Dolin & Lozouet, 2004:26, pl. 13, figs. 4-5, 6a-6c.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Cypraeorbis* Conrad, 1865.

*elegantissima*, *Schilderia* Dolin & Lozouet, 2004:42, pl. 18, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

*elliptica*, *Proadusta* Dolin & Lozouet, 2004:26-27, pl. 11, figs. 3a-3c, 4.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

*epibosensis*, *Praerosaria* Dolin & Lozouet, 2004:68, pl. 29, figs. 1a-1c, 2.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*eripnides*, *?Palaeocypraea* Darragh, 2002:357, figs. 2A-D.

**Type Locality:** Late Paleocene-Early Eocene (late Teurian-late Waipawan), Red Bluff Tuff. Wave-cut platform below "The Bluff" homestead, Pitt Id., Chatham Ids., New Zealand (loc. CH/f471).

**Type Material:** Holotype TM no. 8124, paratype TM no. 8125.

*eristicos*, *Lyncina* Dolin & Lozouet, 2004:12, pl. 5, figs. 1a-1c.  
**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mâinot), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*estotiensis*, *Plaziatia* Dolin & Lozouet, 2004:57-58, pl. 23, figs. 4a-4c.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*fasciolaria*, *Schilderia* Dolin & Lozouet, 2004:42-43, pl. 19, figs. 5a-5c, 6.

**Type Locality:** Upper Miocene (Messinian). Brigné (Beugnon), Maine et Loire Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Junior synonym of *Schilderia andegavensis* (Defrance, 1826).

*faviai*, *Ransonia* Dolin & Lozouet, 2004:33-34, pl. 14, figs. 2a-2c, 3.

**Type Locality:** Upper Oligocene (Chattian). Peyrehorade (La Peyère), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*ferruginosa*, *Ransonia* Dolin & Lozouet, 2004:34, pl. 15, figs. 3a-3c, 4.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*Floradusta* Petuch, 2004:279.

**Type Species:** *Floradusta heilprini* (Dall, 1890).

*frassinetti*, *Zonaria* (*Zonaria*), Groves & Nielsen, 2003:352-353, figs. 1-2.

**Type Locality:** Early late Miocene (Tortonian) Navidad Formation. Tidal platform approximately 1 km north of Matanzas (33°57'27"S, 71°52'15"W), Santiago Province, Chile (loc. SGOPI 031282).

**Type Material:** Holotype SGOPI no. 4972, paratype SGOPI no. 4971.

*gaasensis*, *Cypraeorbis*, Dolin & Lozouet, 2004:10, pl. 1, figs. 1a-1c.

**Type Locality:** Early Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype MNHN.

*gabrieleae*, *Siphocypraea* (*Pahayokea*) Petuch, 1904:278, pl. 71, figs. G-I.

**Type Locality:** Pliocene (Piacenzian), Fruitville Member (Unit 2), uppermost Tamiami Formation, Okeechobee Group, Bottom of Rucks Pit, Ft. Drum, Okeechobee Co., Florida.

**Type Material:** Holotype AMNH no. 50662, 3 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*gemmosa*, *Proadusta* Dolin & Lozouet, 2004:27, pl. 11, figs. 5a-5c, 6.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Cypraeorbis* Conrad, 1865.

*girardae*, *Ransonia* Dolin & Lozouet, 2004:35, pl. 16, figs. 1a-c, 2.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Schilderia* Tomlin, 1930.

*globulina*, *Calusacypraea* Petuch, 2004:273-274, pl. 5, figs F-G.

**Type Locality:** Pliocene (Piacenzian), Pinecrest Member (Sarasota Unit 7), Tamiami Formation, Okeechobee Group, Quality Aggregates, Inc. phase 6 pit, Fruitville, Sarasota, Sarasota Co., Florida.

**Type Material:** Holotype AMNH no. 50656, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*gofasi*, *Ransonia* Dolin & Lozouet, 2004:35-36, pl. 14, figs. 5a-5c, 6.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Abesse "Château"), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*gourguesi*, *Lyncina* Dolin, 1998:105-107, figs. 1-2.

**Type Locality:** Early Miocene (Aquitanian). Vives' Quarry, Meilhan, Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932. This species was not included in Groves, 2000.

*haueriana*, *?Prozonarina* Dolin & Lozouet, 2004:49-50, pl. 21, figs. 1a-1c.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Estoti), Landes Dep't., France.

**Type Material:** Holotype MNHN.



*herosae*, *Praerosaria* Dolin & Lozouet, 2004:68-69, pl. 32, figs. 5a-5c, 6.

**Type Locality:** Upper Oligocene (Chattian). Peyrehorade (La Peyrère), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*herreensis*, *Subepona* Dolin & Lozouet, 2004:62, text figs. 15a-15c, pl. 27, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Bezzoye "Ruisseau"). Landes Dep't., France.

**Type Material:** Holotype and paratype MNHM.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*imperialis*, *Lyncina* Dolin & Lozouet, 2004:13, pl. 6, figs. 2a-2c.

**Type Locality:** Lower Miocene (Burdigalian). Saucats (Le Peloua), Gironde Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miohyncina* Schilder, 1932.

*inconita*, *Schilderia* Dolin & Lozouet, 2004:43-44, pl. 20, figs. 4a-4c, 5.

**Type Locality:** Upper Miocene (Messinian). Brigné (Beugnon), Maine et Loire Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Junior synonym of *Schilderia andegavensis* (Defrance, 1826).

*inhereditaria*, *Ransonina* Dolin & Lozouet, 2004:36-37, pl. 16, figs. 7a-7c, 8.

**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mainot), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Schilderia* Tomlin, 1930.

*jeanae Bernaya* (*Bernaya*) Groves, 2004:46-47, figs. 4-5.

**Type Locality:** Upper Cretaceous (lower Campanian), informal Pentz Road member, Chico Formation. Along Dry Creek, near Pentz, Butte Co., California, (LACMIP loc. 17611).

**Type Material:** Holotype LACMIP no. 13067, paratype LACMIP no. 13068.

*joannae*, *Macrocypraea*, Petuch, 2004:280, pl. 88, figs. K-L.

**Type Locality:** Pleistocene (Aftonian), Holey Land Member, lower Bermont Formation, Okeechobee Group. Mecca orange grove fill pit, westernmost Palm Beach Lakes Boulevard, rural North Palm Beach, Palm Beach Co., Florida.

**Type Material:** Holotype AMNH no. 50665, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*lauriatæ*, *Schilderia* Dolin & Lozouet, 2004:44, pl. 20, figs.

6a-6c, 7.

**Type Locality:** Upper Miocene (Messinian). Brigné (Beubnon), Maine et Loire Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Junior synonym of *Schilderia andegavensis* (Defrance, 1826).

*ledoni*, *Zonaria* Dolin & Lozouet, 2004:59, pl. 26, figs. 4a-4c, 5-6.

**Type Locality:** Middle Miocene (Langhian/Serravallian). Ferrière-Larçon (La Placette), Indre et Loire Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Junior synonym of *Schilderia dujardini* (Schilder, 1927).

*liviae*, *Zonarina* Fehse & Vicián, 2004:201-208, pl. 1, figs. 1-3, pl. 2, figs. 1-5.

**Type Locality:** Middle Miocene (lower Bandian). Bábd, Veszprém Co., Hungary.

**Type Material:** Holotype GIH no. M-2541, 1 paratype in collection of Z. Vicián (Budapest, Hungary).

*Loxacypraea* Petuch, 2004:279.

**Type Species:** *Loxacypraea chilona* (Dall, 1900).

*maestratii*, *Lyncina* Dolin & Lozouet, 2004:13-14, pl. 2, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chattian). Peyrehorade (La Peyrère), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Miohyncina* Schilder, 1932.

*magnifica*, *Lyncina* Dolin & Lozouet, 2004:14-15, pl. 5, figs. 2a-2c.

**Type Locality:** Lower Miocene (Burdigalian). Mérignac (Baour), Gironde Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miohyncina* Schilder, 1932.

*maynotensis*, *Zonarina* Dolin & Lozouet, 2004:40-41, pl. 17, figs. 4a-b, 5a-5c.

**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mainot), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*mexicana*, *Cypraeorbis alabamensis* Perrilliat, Avendaño, & Vega, 2003:46, figs. 13-16.

**Type Locality:** Middle Eocene, San Juan Formation. Southeast of Tuxtla Gutiérrez, Chiapas, México (loc. IHN 1005).

**Type Material:** Holotype IHN no. 6712, paratype IGM no. 7600.



*mineurensis*, *Prozonarina* Dolin & Lozouet, 2004:50-51, pl. 21, figs. 2, 3a-3c.

**Type Locality:** Upper Oligocene (Chatian). Pontonx (Vallon de Mineur), Landes Dep't., France.

**Type Material:** Holotype and paratype MHNH.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*minuscula*, *Ransonina* Dolin & Lozouet, 2004:37, pl. 16, figs. 3a-3c, 4.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dept., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Schilderia* Tomlin, 1930.

*miopropinqua*, *Lyncina* Dolin & Lozouet, 2004:15, pl. 4, figs. 3, 4a-4c.

**Type Locality:** Lower Miocene (Aquitanian). Meilhan (Carrière Vives), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*myakka*, *Calusacypraea* (*Myakkacypraea*) Petuch, 2004:274-275, pl. 64, figs. D-E.

**Type Locality:** Pliocene (Piacenzian). Fruitville Member (unit 4, "Black Layer"), Tamiami Formation, Okeechobee Group, APAC pit, Fruitville, Sarasota, Sarasota Co., Florida.

**Type Material:** Holotype AMNH no. 50657, 3 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

(*Myakkacypraea*) Petuch, 2004:274.

**Type species:** *Calusacypraea* (*Myakkacypraea*) *myakka* Petuch, 2004.

*nigricans*, *Prozonarina* Dolin & Lozouet, 2004:51, pl. 22, figs. 3a-3c, 4.

**Type Locality:** Upper Oligocene (Chatian). Pontonx (Vallon de Mineur), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

(*Okeechobea*) Petuch, 2004:275-276.

**Type species:** *Siphocypraea* (*Okeechobea*) *brantleyi* Petuch, 2004.

*orbiculata*, *Schilderia* Dolin & Lozouet, 2004:45, pl. 19, figs. 1a-1c, 2.

**Type Locality:** Lower Miocene (Burdigalian). St. Jean-de-Marsacq (Lahitet), Landes Dep't., France.

**Type Material:** Holotype and paratype MHNH.

**Remarks:** Specimen in fig. 2 equals *Zonarina liviae* Fehse & Vicián, 2004.

(*Pahayokea*) Petuch, 2004:276-277.

**Type species:** *Siphocypraea* (*Pahayokea*) *penningtonorum*

Petuch, 1994.

*parasigmapertura*, *Plaziatia* Dolin & Lozouet, 2004:58, pl. 23, figs. 1a-1c, 2-3.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*parvissima*, *Proadusta* Dolin & Lozouet, 2004:28, pl. 11, figs. 1a-1c, 2.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Cypraeorbis* Conrad, 1865.

*paulensis*, *Schilderia* Dolin & Lozouet, 2004:45-46, pl. 18, figs. 3a-3c.

**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mainot), Landes Dep't., France.

**Type Material:** Holotype MNHN.

*paulonaria*, *Praerosaria* Dolin & Lozouet, 2004:69, pl. 28, figs. 2a-2c, 3.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*pelouaensis*, *Luria* (*Tessellata*) Dolin & Lozouet, 2004:22-23, pl. 10, figs. 3, 4a-4c.

**Type Locality:** Lower Miocene (Burdigalian). Saucats (Le Peloua), Gironde Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Luria* s.s. Jousseume, 1884.

*perlacea*, *Praerosaria* Dolin & Lozouet, 2004:70, pl. 31, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chatian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*Plaziatia* Dolin & Lozouet, 2004:52-53.

**Type Species:** *Cypraea robertsi* Hidalgo, 1906.

**Remarks:** Subjective synonym of *Pseudozonaria* Schilder, 1927

*ponderosa*, *Lyncina* Dolin & Lozouet, 2004:15-16, pl. 4, figs. 1a-c, 2.

**Type Locality:** Lower Miocene (lower Aquitanian). St. Paul-lès-Dax (Mainot), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*popenoei*, *Beruaya* (*Protocypraea*) Groves, 2004:47-48, figs. 10-11.

**Type Locality:** Upper Cretaceous (lower Campanian), Holz Shale Member, Ladd Formation, Lucas Canyon, Santa Ana Peak quadrangle, Santa Ana Mountains, Orange Co., California (UCMP loc. A304).

**Type Material:** Holotype UCMP no. 154951.

*pouyensis*, *Ransonia* Dolin & Lozouet, 2004:37-38, pl. 15, figs. 7a-7c, 8.

**Type Locality:** Upper Oligocene (Chatian), St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonarina* Sacco, 1894.

*Praerosaria* Dolin & Lozouet, 2004:62-63.

**Type Species:** *Cypraea* (*Proadusta*) *splendens* var. *exflaveola* Sacco, 1894.

**Remarks:** Subjective synonym of *Proadusta* Sacco, 1894.

*prosila*, *Umbilia* (*Umbilia*) Darragh, 2002:365-366, figs. 15A-C, E, H.

**Type Locality:** Late Oligocene (Janjukian), Jan Juc Formation, Bird Rock Cliffs, Torquay, Victoria, Australia.

**Type Material:** Holotype VM no. P308716, paratype VM no. P308717.

*Pseudadusta* Petuch, 2004:275.

**Type species:** *Pseudadusta lindae* (Petuch, 1986).

*pseudorugosa*, *Praerosaria* Dolin & Lozouet, 2004:70-71, pl. 30, figs. 4a-4c, 5.

**Type Locality:** Lower Oligocene (Rupelian), Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*pseudotalpa*, *Luria* (*Tessellata*) Dolin & Lozouet, 2004:23, pl. 9, figs. 5a-5c.

**Type Locality:** Lower Miocene (Burdigalian), St. Paul-lès-Dax (Moulin de Cabanes), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Luria* s.s. Jousseume, 1884.

*Ransonia* Dolin & Lozouet, 2004:29-30.

**Type Species:** *Cypraea punctata* Linné, 1771.

**Remarks:** Subjective synonym of *Notadusta* Schilder, 1935.

*regalis*, *Prozonarina* Dolin & Lozouet, 2004:51-52, pl. 22, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chatian), St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

*renardi*, *Propustularia* Dolin, 1998:107, figs. 5-7.

**Type Locality:** Lower Miocene (Aquitanian), Vives' Quarry, Meilhan, Landes Dep't., France.

**Type Material:** Holotype and 2 paratypes MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894. This species was not included in Groves, 2000.

*rostralina*, *Proadusta* Dolin & Lozouet, 2004:28-29, pl. 12, figs. 3a-3c, 4.

**Type Locality:** Lower Oligocene (Rupelian), Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Junior synonym of *Proadusta elliptica* Dolin & Lozouet, 2004.

*rucksorum*, *Siphocypraea* (*Pahayokea*) Petuch, 2004:278-279, pl. 71, figs. J-L.

**Type Locality:** Pliocene (Piacenzian), Fruitville Member (Unit 2), uppermost Tamiami Formation, Okeechobee Group, Bottom of Rucks Pit, Ft. Drum, Okeechobee Co., Florida.

**Type Material:** Holotype AMNH no. 50663, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*runballi*, *Austrocypraea* Fehse, 2003:56-57, pl. 2, figs. 3a-4d, pl. 4, figs. 1a-2d, pl. 4, figs. 4a-e.

**Type Locality:** Middle Miocene Muddy Creek Formation, Hamilton, Victoria, Australia.

**Type Material:** Holotype ZMB no. 22610, paratype ZMB no. 2101.

*schnireli*, *Calusacypraea* (*Myakkacypraea*) Petuch, 2004:275, pl. 67, figs. I-J.

**Type Locality:** Pliocene (Piacenzian), upper Fruitville Member (Unit 2), Tamiami Formation, Okeechobee Group, Quality Aggregates Inc, phase 9 pit, Fruitville, Sarasota, Sarasota Co., Florida.

**Type Material:** Holotype AMNH no. 50658, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*senuti*, *Ransonia* Dolin & Lozouet, 2004:38-39, pl. 14, figs. 4a-4c.

**Type Locality:** Upper Oligocene (Chatian), Peyrehorade (La Peyrère), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Schilderia* Tomlin, 1930.

*Subepona* Dolin & Lozouet, 2004:59-60.

**Type Species:** *Subepona herrenensis* Dolin & Lozouet, 2004.

**Remarks:** Subjective synonym of *Proadusta* Sacco, 1894.

*tabulata*, *Praerosaria* Dolin & Lozouet, 2004:71, pl. 31, figs.

5a-5c, 6.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Specimen in fig. 6 equals *Proadusta biacuta* (Dolin & Lozouet, 2004). Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*tarbelliana*, *Ransonia* Dolin & Lozouet, 2004:39, pl. 15, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Abesse "Château"), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Zonaria* Sacco, 1894.

*testicula*, *Lyncina* Dolin & Lozouet, 2004:16-17, pl. 3, figs. 1a-1c, 2.

**Type Locality:** Upper Oligocene (latest Chattian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dept., France.

**Type Material:** Holotype and paratype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*titaniana*, *Lyncina* Dolin & Lozouet, 2004:17, pl. 3, figs. 3, 4a-4c.

**Type Locality:** Upper Oligocene (latest Chattian). St. Paul-lès-Dax (Bezoye "Falaise"), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*turkestanensis*, *Cypraea* Frebold, 1940:23, pl. 6, figs. 7-7a.

**Type Locality:** Paleocene, West bank of HotanHe River, near Mazar Tagh Historic Site, Xinjiang Zizhiq Prov., China (approx. 38°20'N, 78°40'E).

**Type Material:** Holotype in Mineralogisk-Geologisk Museum, Copenhagen, Denmark(?).

**Remarks:** Because the holotype is a poorly preserved internal mold, this species could possibly be considered a *uomeni dubium*. This species was not included in Schilder & Schilder (1971), Groves (1994) or Groves (2000).

*uzestensis*, *Mauritia* (*Mauritia*) Dolin & Lozouet, 2004:19, pl. 8, figs. 3a-3d.

**Type Locality:** Lower Miocene (Burdigalian). Uzeste (Moulin de Gamachot), Gironde Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Miolyncina* Schilder, 1932.

*veintensis*, *Macrocypraea* Perrilliat, Avendaño & Vega, 2003:46, 48, figs. 19-22.

**Type Locality:** Middle Eocene, San Juan Formation. Southeast of Tuxtla Gutiérrez, Chiapas, México (loc. IHN 1005).

**Type Material:** Holotype IHN no. 6682, paratype IGM no. 7601.

*veronicata*, *Schilderia* Dolin & Lozouet, 2004:46, pl. 20, figs. 3a-3c.

**Type Locality:** Upper Miocene (Redondian). Brigné (Renauleau), Maine et Loire Dep't., France.

**Type Material:** Holotype MNHN.

*vesicularis*, *Cypraeorbis* Dolin & Lozouet, 2004:11, pl. 1, figs. 2a-2c, 3.

**Type Locality:** Lower Oligocene (Rupelian). Gaas (Espibos), Landes Dep't., France.

**Type Material:** Holotype MNHN.

*virodunensis*, *Praerosaria* Dolin & Lozouet, 2004:73, pl. 29, figs. 4a-4c.

**Type Locality:** Upper Oligocene (Chattian). St. Etienne-d'Orthe (Ruisseau de Verdun), Landes Dep't., France.

**Type Material:** Holotype MNHN.

**Remarks:** Valid species reassigned to the genus *Proadusta* Sacco, 1894.

*voleki*, *Luria*, Petuch, 2004:280, pl. 88, figs. A-B.

**Type Locality:** Pleistocene (Aftonian), Holey Land Member, lower Bermont Formation, Okeechobee Group, Palm Beach Aggregates pit, Loxahatchee, Palm Beach Co., Florida.

**Type Material:** Holotype AMNH no. 50664, 2 paratypes in research collection of E.J. Petuch (Lake Worth, Florida, USA).

*wilfredi*, *Palaeocypraea* (*Palaeocypraea*) Groves, 2004:45-46, figs. 2-3.

**Type Locality:** Upper Cretaceous (lower Campanian), informal Pentz Road member, Chico Formation. Along Dry Creek, near Pentz, Butte Co., California (LACMIP loc. 17611).

**Type Material:** Holotype LACMIP no. 13065, paratype LACMIP no. 13066.

**Remarks:** First cypraeoidean species reported from the Chico Formation.

#### Family Eocypraeidae

*aquensis*, *Cypraeopsis* (*Cypraeopsis*) Dolin & Lozouet, 2004:80, pl. 36, figs. 3a-3c, 4.

**Type Locality:** Upper Oligocene (Chattian). St. Paul-lès-Dax (Bezoye "Ruisseau"), Landes Dep't., France.

**Type Material:** Holotype MNHN.

*dolini*, *Pseudocypraea* Pacaud, 2003:456-460, figs. 3C-E, 4A-C.

**Type Locality:** Middle Eocene (Bartonian). Le Quonian, near Haravilliers, Val d'Oise Dep't., France.

**Type Material:** Holotype MNHN no. R63008.

**Remarks:** Valid species reassigned to the genus *Eocypraea* Cossmann, 1903.

*ganensis*, *Prionovolva* (*Grovesia*) Dolin & Ledon, 2002:335-336, figs. 1A-D.

**Type Locality:** Early Eocene (uppermost Ypresian). Gan (La Tuilerie), Pyrénées-Atlantiques Prov., France.

**Type Material:** Holotype MNHN no. R63009, 1 paratype MNHN no. R63010, 7 paratypes MNHN no. R63011, 1 paratype UBT.

**Remarks:** Valid species reassigned to the genus *Sulcocypraea* Conrad, 1865.

(*Grovesia*) Dolin & Ledon, 2002:334-335.

**Type species:** *Prionovolva* (*Grovesia*) *ganensis* Dolin & Ledon, 2002.

**Remarks:** Currently a subgenus of *Sulcocypraea* Conrad, 1865.

*merlei*, *Luponovula* Dolin & Ledon, 2002:336-338, figs. 3A-C.

**Type Locality:** Lower Eocene (uppermost Ypresian). Gan (La Tuilerie), Pyrénées-Atlantiques Prov., France.

**Type Material:** Holotype MNHN R63012, 1 paratype MNHN R63013, 1 paratype UBT.

**Remarks:** Valid species reassigned to the genus *Sphaerocypraea* Schilder, 1927.

*nodulosa*, *Jenneria* (*Jenneria*) Dolin & Lozouet, 2004:79, pl. 35, figs. 1a-1c, 2a-2b.

**Type Locality:** Lower Miocene (Aquitanian). St. Paul-lès-Dax (Mainot), Landes Dep't., France.

**Type Material:** Holotype MNHN.

*spatiosa*, *Apiocypraea* Fehse, 2004:39-40, figs. 2-3, 5.

**Type Locality:** Middle Pliocene (lower Piacenzian). Tabbiano, Italy.

**Type Material:** Holotype CS no. 5001, paratype CS no. 5144.

*tardivela*, *Sphaerocypraea* Dolin & Ledon, 2002:340-341, figs. 4A-B.

**Type Locality:** Lower Eocene (uppermost Ypresian). Gan (La Tuilerie), Pyrénées-Atlantiques Prov., France.

**Type Material:** Holotype MNHN R63014.

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## CLUB NEWS

### The Annual September Party

It was a grand party with many members arriving promptly at 4:30 p.m. There were over 28 of us there and it felt like a reunion – everyone so happy to see one another. Debbie and Larry Catarius were great hosts and seemed to enjoy their guests as much as everyone enjoyed being there. Their beautiful home is a shell collector's paradise with shells and marine artifacts everywhere and an outside fence wall covered with lobster floats – members were "touring" constantly.

As usual, the food was great – mostly all home cooked or home smoked (fish), terrific salads and tasty casseroles and side dishes. Wine, beer and soft drinks were available and the healthy appetites of Club members were well sated.

The conversations and stories on shells, travel, diving etc., in different areas both inside and outside the Catarius' home, continued on through to the evening hours and members were reluctant to leave such a lovely affair.

Our thanks to Debbie and Larry for hosting this fine party.

### The Annual Christmas Dinner Party

The next big social event for the Club is the annual Christmas Dinner Party. By popular demand the party will be held in the same place as last year – at the Butcher Shop in Kearny Mesa. The menu and cost of the evening will be announced later and maps will be provided with the November issue.

As part of the traditional festivities, the speaker for the evening has already accepted. It will be our own terrific storyteller and fantastic photographer, Richard Herrmann – with his wonderful images and fascinating subjects.

Saturday evening December 3<sup>rd</sup> is the date so mark you calendars and plan to attend!

### Change of E-mail

Kronenberg, Gijis, ads1711249@tiscali.nl

### New Books Announced

Donald Dan\*, [6704 Overlook Drive, Ft. Myers, FL 33919, USA Tel. & Fax (239) 481-6704] announces two new books on mollusks

*RECENT & FOSSIL INDONESIAN SHELLS* by Dharma, B. ISBN 3-925919-70-8 Hardbound, section sewn, bowed spine. Price: \$115.00 plus \$4.00 for Book Rate mailing (add 6% sales tax for Florida buyers).

"An updated combination of the author's previous two volumes on Indonesian shells, plus many new entries. Text now in English instead of Indonesian. Illustrated coverage of 1,982 Recent species and 723 fossil species. The Recent section also includes 365 terrestrial and fresh water species. Total of 424 pages, with 110 color plates of Recent species and 40 b/w plates of fossil species."

*SHELLS OF VIETNAM*, by Thach, N. N. ISBN 3-925919-71-6

Price: \$ 125.00 plus \$4.00 for Book Rate mailing (add 6% sales tax for Florida buyers).

"First major reference shell book for this country. Total of 429 pages, covering 1,534 species and subspecies of marine and terrestrial shelled mollusks. All text in English. Color illustrations are contained in 91 plates. Hardbound, section sewn, bowed spine."

\*Donald announces that orders will be mailed with enclosed invoice and return envelope for you to send payment.

### SCAMIT Announces a New Newsletter Format

Treasurer Cheryl Brantley announces "a new SCAMIT newsletter out and currently posted on our website [www.SCAMIT.org](http://www.SCAMIT.org). [Hint- right click on the image of the "bucket of crabs" and save the PDF file to your machine and then open the saved file in the Acrobat Reader.]

The newsletter has a new look to it with a table of contents and a one column format. Also, this is the first edition of our bimonthly format. The minutes for the crustacean meeting in May are included as well as new literature reviewed by Don Cadien."

ON THE COLOR FORM (OR SPECIES?) *LINEATA* STEARNS, 1873,  
OF *AMPHISSA VERSICOLOR* DALL, 1871,  
WITH ILLUSTRATIONS OF OTHER NAMED FORMS OF THE SPECIES  
(GASTROPODA: COLUMBELLIDAE)

JAMES H. MCLEAN<sup>1</sup> & PAUL KANNER<sup>2</sup>

<sup>1</sup>Natural History Museum of Los Angeles County, 900 Exposition Boulevard., Los Angeles, California, 90007  
jmclean@nhm.org,

<sup>2</sup>10609 Esther Avenue, Los Angeles, California 90064  
pkann@comcast.net

**Abstract.** *Amphissa versicolor* var. *lineata* Stearns, 1873, has previously been known only from the original illustration; it is here treated for the first time, based on the recognition of 13 shells and one living specimen. The color pattern of the foot and siphon differs from that of *A. versicolor* Dall, 1871, and the color pattern of all 13 shells is consistently different, but questions remain as to recognition of a separate species. Other named forms of the species (*cymata* Dall, 1916, and *incisa* Dall, 1916) are discussed and illustrated.

### Introduction

This paper was precipitated by the collection of a strikingly colored, small-shelled gastropod by Paul Kanner in June 2004 during a dive at Santa Cruz Island, California. Color photos of the living animal were made by Kanner, following which the shell was identified by McLean as the rare color form *lineata* Stearns, 1873, of the columbellid *Amphissa versicolor* Dall, 1871. These photos have already been made available on a website (jaxshells.org). Here we reproduce the photos of the living animal (Figures 2, 3) and further discuss the significance of this unusual find. McLean's contribution is to review the history of the name *lineata*, report upon other known specimens, and to discuss its affinity to *A. versicolor*. Opportunity is here taken to illustrate and comment upon the other named forms of the species *versicolor*.

### Institutional Abbreviations

LACM – Natural History Museum of Los Angeles County, California.

USNM – National Museum of Natural History, Washington, D. C.

### Systematics

Family COLUMBELLIDAE Swainson, 1840  
Genus *AMPHISSA* H. & A. Adams, 1853

#### *Amphissa versicolor* Dall, 1871

Figures 1-11

*Amphissa versicolor* Dall, 1871: 113, pl. 13, f. 2, pl. 14, f. 2, pl. 16, f. 10, 11 (holotype USNM 6184; type locality: Monterey, California).

*Amphissa* (? *versicolor* var.) *lineata* Stearns, 1873 ["1872"], pl. 1, f. 8 (holotype USNM 12284; type locality: Monterey, California).

*Amphissa versicolor* var. *cymata* Dall, 1916: 27 [unfigured] (holotype USNM 12295; type locality Monterey, California) [catalog number from label].

*Amphissa versicolor* var. *incisa* Dall, 1916: 27; 1919: 331; 1921, pl. 11, f. 10 (holotype USNM 12285; type locality: Laguna Beach, California).

There are no current accounts of variation in this highly variable species; the most detailed treatment remains that of the original description (Dall, 1871: 93), based on live - collected material and including



descriptions of the radula and operculum. Dall noted that he had spent three weeks at Monterey, California, in January 1866, finding that the species *versicolor* was "the most common beach shell found at Monterey.... very uniform in size though so variable in color." The final line of the original description reads "Colors very variable, pink, salmon color, livid bluish purple, brown and pure white, all plain, or variously marked with a network of white and brown lines, patches, dots."

The name *lineata* was introduced in January 1873 by R. E. C. Stearns, in Volume 4 of the Proceedings of the California Academy of Sciences. The name appears only in the caption to Plate 1 (unnumbered page 322), for which figure 8 is identified as "*Amphissa* (? *versicolor* Dall, var.) *lineata* Stearns," with no pagination cited for a description. It seems that Stearns may have already prepared his description and illustration before seeing Dall's description of the species *versicolor*, and may have changed his mind, seeing that Dall had already noted the possible pattern of "white and brown lines." Perhaps it was too late to remove the figure from the plate, but Stearns may have decided not to publish the description of a questionable species. Until now, the dating of Plate 1 (which provided illustrations for other papers in Volume 4) has been cited as 1872, but Gene Coan (personal communication) has determined that it could only have been published as early as January 1873, because it served to illustrate other papers now dated as 1873.

The original illustration at twice natural size is unmistakably the form treated here, but there has never been a subsequent description or further illustration connected to the name *lineata*. The holotype is USNM 12284, a beachworn shell, with the name *lineata* handwritten on the printed label: "Monterey Harbor, Stearns collection."

Forty-five years after describing the species *A. versicolor*, Dall (1916: 27), in a brief review of all eastern Pacific columbellids, briefly mentioned three varieties of the species: *lineata* Stearns, "1872" (listed only); the then new *cymata* (figure 9), "with distinct brown axially waved lines on a white ground;" and the then new *incisa* (figure 10), "with sharply cut regular sculpture and beautifully mottled coloration". The variety *incisa* was provided with a more complete description by Dall (1919: 371), but no comparisons were given.

The typical *Amphissa versicolor* and all three varieties were subsequently listed in Bulletin 112 by Dall (1921: 105), with only the locality Monterey given for *lineata*. Oldroyd (1927) provided copies of original

descriptions of all taxa listed by Dall in Bulletin 112 (1921). The name *lineata* was not included by Oldroyd because there was no original description.

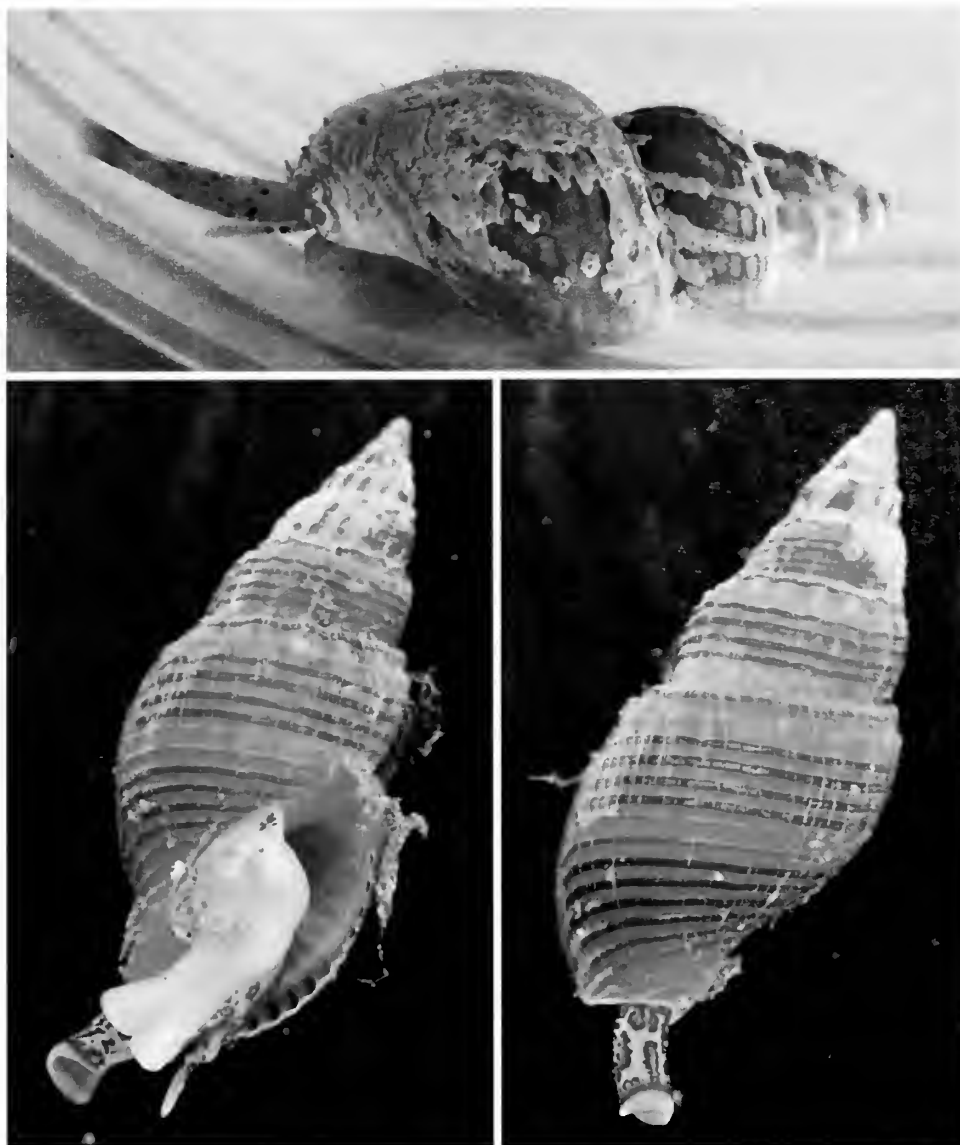
According to the ICZN rules, taxa described as varieties are available as species names if published prior to 1960, including those based only on a name in a plate caption without an accompanying description. Now, more than 130 years later, there is still the question as to whether *lineata* is a color form or a distinct species.

Although the species *versicolor* is indeed highly variable, the *lineata* form (Figures 2-6) is without exception consistent in having the color pattern of dark brown spiral cords, interrupted by a lack of the color pattern below the shoulder and at mid-whorl; the first cord below the suture is dark-colored, with two lighter cords below and one lighter cord at mid-whorl. Aside from that difference, there seem not to be other distinguishing shell characters that are consistent, as all specimens have similar lip lirae, axial sculpture and columellar callus. Two specimens collected together at Dana Point, Orange County, California are shown for comparison of shell morphology, the lineate form in Figure 6 and the non-lineate form in Figure 7. Another comparison is provided between Figures 5 and 8 for specimens from the Monterey area. These two comparisons show that only the color pattern can be used to separate shells.

Dall (1871) noted that the animal of *versicolor* is white with black dots and streaks, which agrees with Kanner's photo of a specimen of a usual example of *versicolor* (Figure 1). However, Kanner's photos of the living *lineata* (Figures 2, 3) show a more complex, paisley pattern of larger, irregular dark markings, each marking with an irregular, darker edge and lighter central area. These differences in the color markings of the foot and siphon are so striking that they reinforce the shell distinctions and provide further evidence in support of a conclusion that there may be two separate species.

It is clear that the form *lineata* is indeed rare, compared to *A. versicolor*. Examination of 370 catalogued lots of *A. versicolor* in the LACM (Natural History Museum of Los Angeles County) collection led to separation of only nine lots of the *lineata* form (total of 13 specimens) in the LACM collection.

The variation of *A. versicolor* is extensive, including forms that have a more impressed suture and other forms with more pronounced axial and spiral sculpture. The species was based on live-collected material from Monterey; the original illustration is in color, but the shell is not shown large enough to convey



Figures 1-3. *Amphisia versicolor*, living specimens, 25 m, Yellowbanks, Santa Cruz Island, California collected and photographed by Paul Kanner, June 2004. (1, top) Living specimen of *A. versicolor*, with eroded surface sculpture. (2, 3 bottom) Living specimen of form *lineata*.

detail. There was no mention of type material, but Dall (1871) gave the length of *A. versicolor* as .48 inches, which agrees with USNM 6184, a dead-collected specimen in very poor condition (with bryozoan encrustations) from Monterey, now labeled “type” and entered as such in the USNM type collection and type database; this specimen measures 12.5 mm in length, which agrees with the original measurement of .48 inches. Oldroyd (1927: 281) stated: “type in United

States National Museum,” which provides the only reference in the literature to type material for the species.

This specimen has never been figured or to my knowledge cited directly as the “type,” but its low catalog number indicates that Dall must have seen it and at some point decided that an early-collected specimen should represent the species as the holotype, rather than a live-collected specimen in good condition on which the

species was described. Dall was a novice at species descriptions in 1871, a time at which the concept of type specimens was not standardized; there was no usage of the terms "type" or "holotype" for any of the species described in the 1871 paper.

Unfortunately, the specimen now established as the holotype of *A. versicolor* (Figure 9) is not quite representative of most specimens occurring in the Monterey area; the axial ribs are fewer, and the spiral cords are weaker. A better example of the species as it occurs in the Monterey area is shown in Figure 8.

The form described as *incisa* (Figure 11) from southern California, does have sharper and more deeply incised spiral sculpture, but efforts to separate it as a species, by consistent morphology or by depth have not been successful.

Only a single worn specimen with the axial flammules of the color form *cymata* (Figure 10) has been detected in the LACM collection. It is noteworthy that the fewer axial ribs of the holotype of *cymata* is more like that of the holotype of *versicolor*, but again this seems only to be a matter of variation. The holotype of *cymata* is so beachworn that the apical whorls are abraded.

Specimens now determined as *A. versicolor* are represented in the LACM collection from Port Louis, west side of Graham Island, Queen Charlotte Islands, British Columbia (LACM 69-53.16), and south to Punta San Pablo, Baja California Sur (LACM 71-161.33). There are very few lots from localities north of California.

The color form *lineata* has a more limited distribution and is known in the LACM collection only from California. Specimens of the form *lineata* in the LACM collection are known from Shelter Cove, Humboldt County; Monterey, Monterey County (holotype, Figure 5); Pismo Beach, San Luis Obispo County; Santa Cruz Island (Figures 2-4); Palos Verdes Peninsula, Los Angeles County; Catalina Island, and Dana Point, Orange County (Figure 6).

### Conclusions

The argument in favor of separation of *lineata* at the species level is based on the consistent pattern of coloration both in the shell (of all examined specimens) and the pigmentation of the foot and siphon (of a single

specimen), although there seem not to be other differences in shell sculpture. However, such a conclusion does not explain why (if considered a species), it should be so rare compared to *A. versicolor* and why it has not been found away from the more abundant *A. versicolor*. So, the question remains open for now. It may be that there are distinctions in DNA and it is hoped that future students will compare DNA within the genus *Amphissa*.

### Acknowledgments

Black and white imaging (from negatives of McLean) and plate preparation is the work of Michelle Schwengel, of the LACM Malacology Section. We thank Ángel Valdés (LACM) for assembling the color plate. We thank Jerry Harasewych (USNM) for advice and information about the type of *A. versicolor*. We thank Gene Coan and Lindsey Groves for comments on the manuscript.

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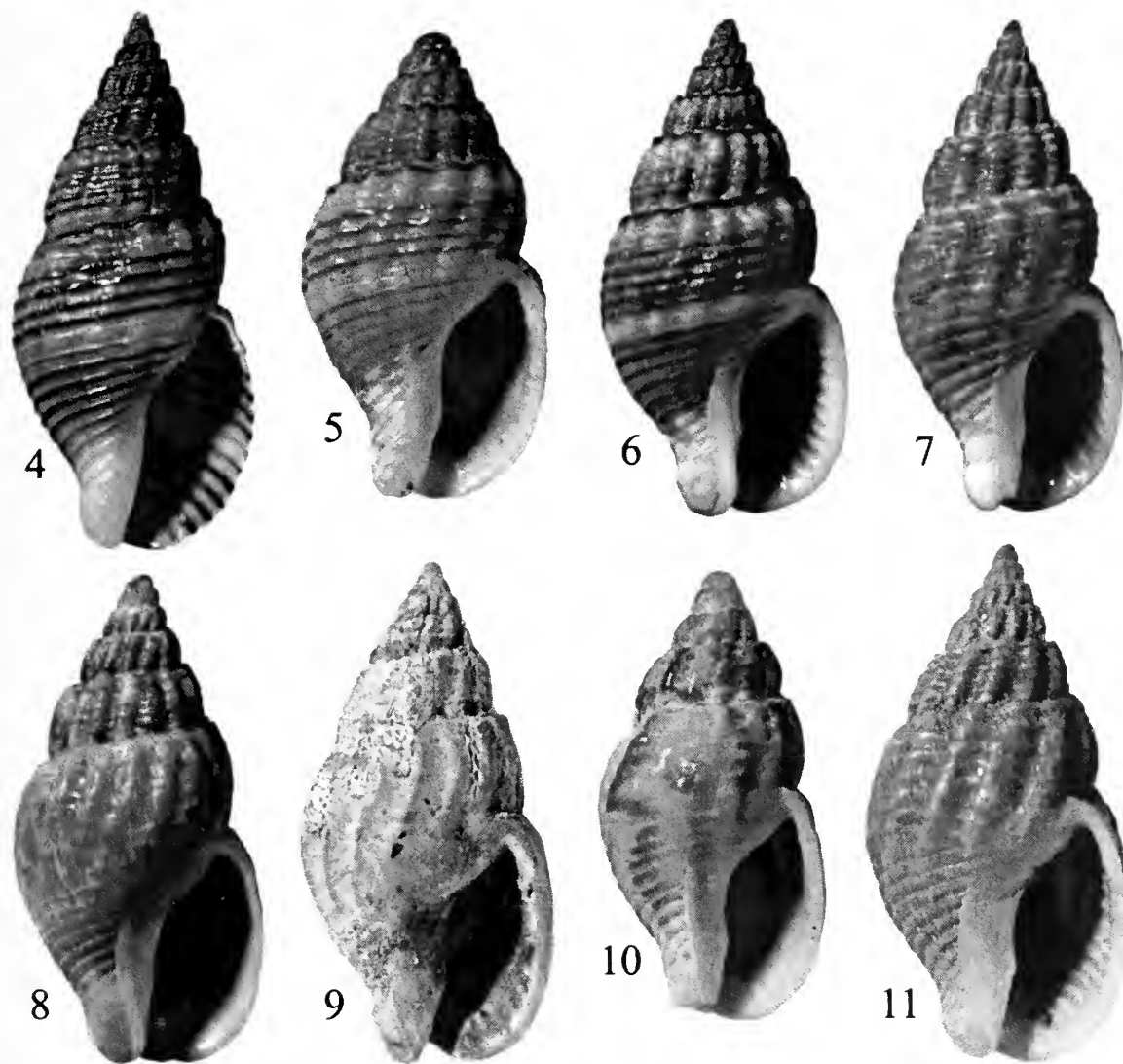
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Figures 4-11. *Amphisca versicolor*, shell specimens, photographed by McLean. (4) Same specimen (immature lip) of form *lineata*, Santa Cruz Island, California, shown in Figures 2 & 3 (LACM 172405); height 16.0 mm. (5) Holotype (beachworn) of *Amphisca versicolor* var. *lineata* Stearns, Monterey, California (USNM 12284); height 11 mm. (6) *Amphisca versicolor*, form *lineata*, Dana Point, Orange County, California (LACM 172406), collected by Mark Rogers in 1957; height 12.5 mm. (7) *Amphisca versicolor* (non-lineate form), Dana Point (LACM 150598 collected by Mark Rogers in 1957); height 12.0 mm. (8) *Amphisca versicolor* (non-lineate form), Carmel, Monterey County, California (LACM 81-47.21); height 11.3 mm. (9) Holotype (poor condition) of *A. versicolor* Dall, Monterey, California (USNM 6184); height 12.5 mm. (10) Holotype (beachworn) of *Amphisca versicolor* var. *cymata* Dall, Monterey, California (USNM 12295); height 10.0 mm. (11) Holotype of *Amphisca versicolor* var. *incisa* Dall, Laguna Beach, Orange County, California (USNM 12285); height 13.5 mm.



FURTHER NOTES ON *DERMOMUREX ALABASTRUM*  
(A. ADAMS, 1864) (GASTROPODA, MURICIDAE)

SUSAN J. HEWITT

American Museum of Natural History

Send correspondence to: 435 East 77<sup>th</sup> Street, Apt 3G, New York, NY 10021, USA

E-mail: hewsub@earthlink.net

This contribution is intended as an addendum to Hewitt (2003), "The strange history of *Dermomurex alabastrum* (A. Adams, 1864), (Gastropoda, Muricidae) and a new locality for the species from Nevis, West Indies." That paper omitted any discussion of type material, but subsequent to the paper's publication, Kathie Way (Collections Manager, Higher Invertebrates Division, Department of Zoology at the Natural History Museum in London) was kind enough to inform me that Adams' type material for this species is in the NHM collection. She also generously arranged for photographs to be taken and sent to me. The lot number for the five syntypes is BMNH 1974127, and the sizes of the shells are approximately: 25, 21, 20, 17.5 and 12 mm. All five syntypes do appear to be shells of the same species.

As mentioned in Adams' original description, which is quoted in full in Hewitt (2003), the syntype shells were found on Martinique, West Indies, by the extraordinary collector and dealer Hugh Cuming (1791–1865), whose life was described by Dance (1980). The lot of five shells was presumably sold by Cuming to Arthur Adams in London. Adams' description of the species was presented to the Zoological Society of London in 1863, and published in their Proceedings in 1864.

The five syntypes are all clearly beach drift material. Only the two largest shells are shown here (Figure 1) because they are both in reasonably good condition, whereas the three smaller shells in the lot are very worn. Small traces of intritacalx are visible on all of the shells. In addition, the shells have, affixed to their surface, remnants of a spot of glue. (In the 18<sup>th</sup> and 19<sup>th</sup> Centuries, shells in museum collections were routinely glued to card or wooden mounts and displayed to the public.)

All five syntypes are completely white (confirmed

by Way, personal communication, 2004) and indeed, Adams (1864) described the shell color as "alba" or dull white. In contrast, adult beach drift shells of what is considered to be the same species from Nevis in 2001–04 (collected by Johnson, and by Hewitt), and from Antigua in 1961 (by Usticke), show a very noticeable, orangey-brown coloration, which is most intense on the varices of the body whorl (Hewitt, 2003, figs. 1, 2, 5 and 6). The color is retained on adult shells even when they are relatively beachworn. Only one or two extremely worn juvenile shells in the Usticke lot (AMNH 191702, not illustrated in Hewitt, 2003) are all white.

*Dermomurex alabastrum* is quite rare, and is not well represented in collections, so it is unknown if some populations of this species are naturally all white. But there is another possible explanation for the lack of color in the syntypes: if the shells were cast up during a storm and lay above high-tide level for a very extended period of time, they might possibly have faded to white in the tropical sun. (This process takes place in many species of shells, with some fading more completely than others, presumably depending on the stability of the chemical structure of the various different types of shell pigment.)

The Dall illustration of the holotype of *Trophon engonatus* Dall, 1892 (a fossil shell and a synonym of *D. alabastrum*) is reproduced here as Figure 2, for comparison with the Adams syntypes. The Dall drawing is an accurate illustration of the shell of the species, in contrast to the vague, impressionistic, and misleading original Sowerby (1864) figure, which was reproduced in Hewitt (2003).

One whole shell and one fragment of this species had been found in Nevis, West Indies, in 2001 and 2002 respectively (Hewitt, 2003). It is, perhaps, worth mentioning that a second, whole, worn shell of the

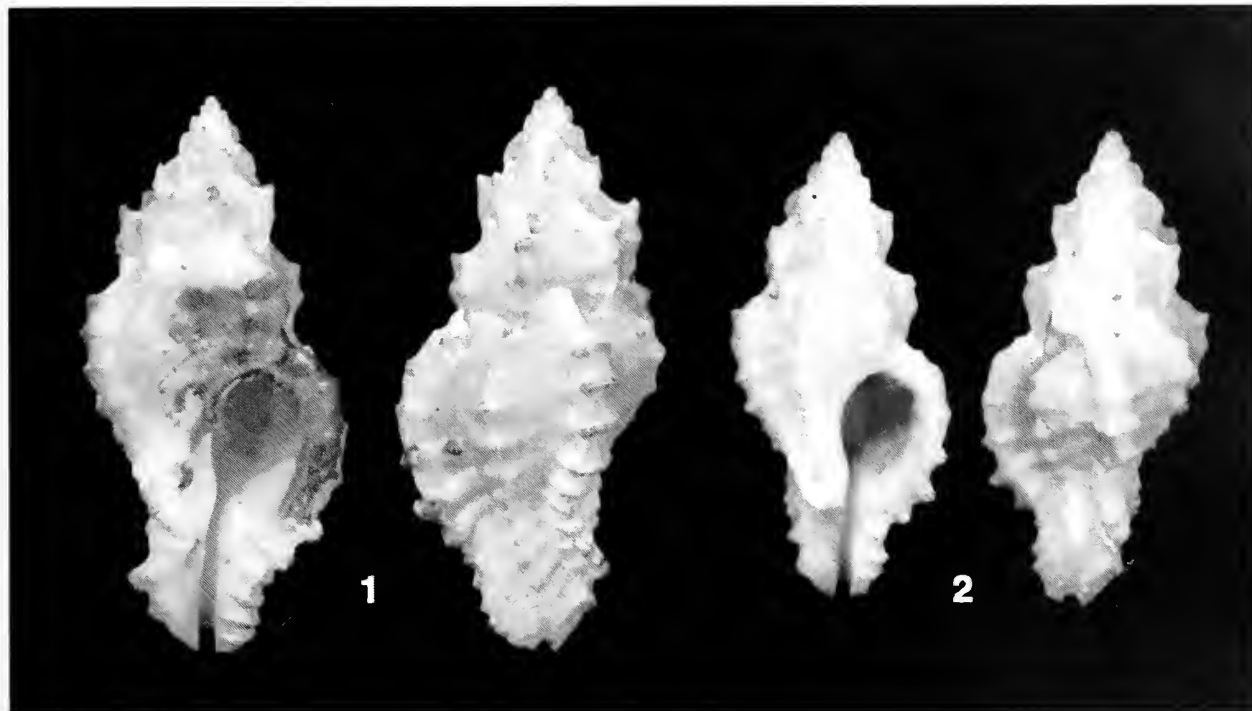


Figure 1. The two largest and least-worn syntypes of *Murex alabastrum* A. Adams, 1864, BMNH 1974127, (1) two views, 25 mm; (2) two views, 21 mm. Photos: Amelia MacLellan. Published with the kind permission of the trustees of the Natural History Museum, London.

### Acknowledgments

I thank Kathie Way both for her correspondence and for arranging for the photographs to be taken and Amelia MacLellan for taking the photographs and sending them to me.

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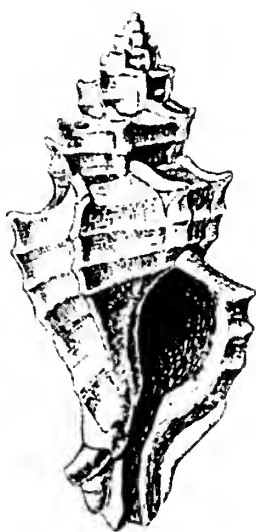


Figure 2. *Trophon (Aspella) engonatus* Dall, 1892, 28 mm, from Dall, 1892, plate 13, figure 6a.

species was found in the same locality on Nevis by the author in 2003 and another fragment was found in 2004.

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# THE FESTIVUS

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## PROGRAM

### Following the Trails of Various Volutes

Henry W. Chaney of the Santa Barbara Museum of Natural History will present a slide program on the molluscan family Volutidae and discuss the habitats of these beautiful animals.

### Giant Book Sale

Meeting date: November 17, 2005

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting October 20, 2005

President Jules Hertz called the meeting to order at 7:45 pm. The August minutes were approved as published in *The Festivus* and Treasurer Silvana Vollero reported that the Club was "solvent." Vice President John LaGrange announced that Henry Chaney would be the speaker in November and Richard Herrmann would give the program at the Club's Christmas party.

Next Jules announced the Club's slate of officers for 2006: President, Bill Schneider; Vice President, John LaGrange; Treasurer, Silvana Vollero; Recording Secretary, Nancy Schneider; Corresponding Secretary, Marilyn Goldammer. Nominations from the floor will be entertained at the November meeting prior to the election of officers. The new officers will be installed at the Christmas party.

The Christmas party on Saturday evening December 3<sup>rd</sup> was next on the agenda. Jules read the menu for the evening and urged members to attend [see col. 2].

Jules announced that *The Festivus* will be publishing a cumulative index as a supplement. It will probably come out in January. It will be available at no cost to those members who want it. The blue renewal slip that will be sent with the November issue will have a place to indicate if you want the index.

Following the business meeting, Bob Yin gave a beautiful slide program divided into three segments: first -- marvelous images of octopus; second -- beautiful shells from everywhere and third -- sea lions cavorting in the Gulf of California. An incredible series of images showed a sea lion playing "catch" with a diver, using a starfish as the "ball." And what made it more fantastic was that the game was initiated by the sea lion who "brought" the starfish! It was a most enjoyable presentation and members asked for more. So after a refreshment break, Bob very kindly showed some wonderful slides taken in Bali. Everyone was ready to leave for the island immediately.

George Gerrodette won the shell drawing and members enjoyed socializing over delicious

refreshments provided by Marilyn Goldammer and Nancy Schneider.

### Come to the Book Sale at the November Meeting

Just in time for choosing book gifts for the holidays, the Club will be having a giant book sale at the November meeting. There will be many fine hardcover and softcover books as well as a huge selection of reprints, journals and magazines. Come and browse and buy!!

### The Club's Annual Christmas Dinner Party

The Club's holiday party will be held on Saturday evening December 3<sup>rd</sup>. By popular demand, we are again having the function at the Butcher Shop Steak House in Kearny Mesa. The address is 5255 Kearny Villa Rd. Ph. 858-565-2272.

The festivities will begin at 6:00 p.m. with a no host bar and socializing with friends. Dinner will be served promptly at 7:00 p.m. There will be the traditional shell gift exchange and the program this year will be presented by Club member and award-winning photographer, Richard Herrmann.

The dinner menu is as follows: California Salad, choice of entree -- Fillet of Salmon or Prime Rib of Beef -- both served with garlic mashed potatoes and fresh vegetables, dinner rolls and butter, choice of coffee or tea and dessert. The dessert will be White Chocolate Raspberry Cheesecake. The Club will provide the dinner wine.

The total cost of the evening is \$30 per person. Reservations (checks) must be received by November 28<sup>th</sup>. Please include your choice of entree on your check. If you would like to include your renewal with your dinner reservation, that will be fine.

Do remember to participate in the shell gift exchange. Bring a wrapped shell gift to place under the tree with only general locality on the outside. The more who participate, the more fun the party is.

Come to the party and have a great time!!

### Additions and Changes to the Roster

Des Chaine, Lewis, 3029 Silver Lake Rd., St. Anthony, MN 55418-2435. Phone: 612-789-4070

Rutkas, Terry & Kathy, 11410 E. Florence Ave., Santa Fe Springs, CA 90670. Phone: 562-868-8394. E-mail: tjrutkas@verizon.net

## CYPRAEOIDEAN AND TRIVIOIDEAN LITERATURE

2000 - 2004

LINDSEY T. GROVES

Natural History Museum of Los Angeles County, Malacology Section  
900 Exposition Blvd., Los Angeles, California 90007, USA  
E-mail: lgroves@nhm.org

**ABSTRACT:** Since 1999 at least 320 publications that include Recent and fossil cypraeoideans and trivioideans were published subsequent to Groves (2000). Additionally, 351 publications not cited by Schilder & Schilder (1971) or Groves (1994, 2000) are listed. The entry "fig'd" is used for citations in which the number of figures is unknown.

## INTRODUCTION

At least 320 publications that deal entirely or partially with cypraeoideans and/or trivioideans were published from 2000 through 2004. An additional 351 publications not listed in Schilder & Schilder (1971) and/or Groves (1994, 2000) that deal with cypraeoideans and/or trivioideans are listed in the second part of this report. Pertinent references that emphasize or mention cypraeoideans and/or trivioideans include faunal surveys and lists, and general-interest books and papers. Titles marked with an asterisk (\*) indicate works that deal entirely or in part with fossil cypraeoideans and/or trivioideans. Unless otherwise noted, all references are in English and those non-English titles that have English abstracts and/or summaries are likewise noted. References not credited to an author, editor, or publisher are referred to as "anonymous." With the exception of theses and dissertations, unpublished works are not included nor are price lists.

As with previous compilations, despite an exhaustive search of recent literature, particularly journals and other publications received by the Malacology and Invertebrate Paleontology sections of the Natural History Museum of Los Angeles County, some titles may have been inadvertently overlooked. The author requests that missed titles be brought to his attention for inclusion in future compilations.

## ACKNOWLEDGMENTS

Many persons aided in this compilation. Luc Dolin (Civray-de-Touraine, France), Mauro Doneddu (Tempio, Italy), Dirk Fehse (Berlin, Germany), Bernie Landau (Albufeira, Portugal), Felix Lorenz (Gießen, Germany), John Jackson (El Cajon, California), and Chris Meyer (Florida Museum of Natural History) provided books and/or reprints. Gijs C. Kronenberg (Eindhoven, The Netherlands) generously provided photocopies from *Vita Marina* and *Spirula*. James McLean and Ángel Valdés (Natural History Museum of Los Angeles County, Malacology Section) read the brief text and offered suggestions. Librarians Mali Griffin and Don McNamee (Natural History Museum of Los Angeles County, Research Library) processed numerous interlibrary loan requests.

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ANONYMOUS

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
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## PROGRAM

### DOWN TO 600 METERS

Dr. John Butler of the National Marine Fisheries Service will present a program featuring images he took on an ROV from	Point Conception to 60 Mile Bank from shallower water down to 600 m. He will concentrate on images of invertebrates.
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Meeting date: January 19, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting November 17, 2005

The meeting was called to order at 7:30 p.m. by President Jules Hertz. The minutes of the October meeting were approved as published in *The Festivus*.

The Christmas Party will be held on December 3<sup>rd</sup> at The Butcher Shop Restaurant. Deadline for reservations is November 29. Cost of the dinner will be \$30.

The slate of officers for next year, announced at the October meeting, was accepted unanimously. The new board will be installed at the Christmas Party.

Members were urged to return the blue Renewal Notice, by December 10, indicating interest in receiving the Comprehensive Index to *The Festivus*.

Wes Farmer reported that new Botanical Society policy designates janitorial duties to societies utilizing their meeting rooms.

Vice-President John LaGrange introduced the speaker of the evening, Henry Chaney, of the Santa Barbara Museum of Natural History, also a member of the San Diego Shell Club. He spoke on the topic of the molluscan family Volutidae, with emphasis on the influence of habitat on shell morphology. Excellent slides demonstrated his discussion. The audience was given a glimpse of photography in the field, from freshly collected live volutes surrounded by their decorative mantles. Sexual dimorphism was evident, and is also fairly widespread in cones, cowries, and strombus. Variation in a single volutid species was widespread, leading sometimes to several different names. The speaker's Visual Vignettes of Various Volutes was greatly enjoyed by all present.

Dave Mulliner was the winner of the evening's door prize.

The meeting was adjourned at 8:35 p.m. for coffee, with cookies donated by Bruce Kemp and Nancy Schneider. A large Book Sale rounded out the evening.

Nancy Schneider

### A New Addition to the Club Library

Member Don Pisor has generously donated a copy of the 2005 edition of the *Registry of World Record Size Shells* to the Club library. This 171 page soft-covered, ring-bound book has over 9500 listings.

As in previous editions, this 4<sup>th</sup> edition has an Introduction with instructions for submitting entries to the Registry. It is followed in the next 149 pages by the Entries, in alphabetical order by family and genus. A 5-page Appendix I lists the individuals with record size shells and their amounts of records and Appendix II lists the references used. This is followed by Footnotes and Record submission forms.

This book will be useful to those interested in record sized shells and those wanting to know just how big a species can be. Our thanks to Don for this gift.

### The Club's Annual Christmas Dinner Party

The Club's holiday party on Saturday evening December 3<sup>rd</sup> was again at the Butcher Shop Steak House in Kearny Mesa with festivities beginning at 6:00 p.m. Thirty-two attendees filled the cozy room complete with Christmas tree and table centerpieces of poinsettias in shells, the shells again generously donated by Don and Jeanne Pisor.

The delicious dinner was served at 7:00 p.m. following a welcome by MC Carole Hertz who announced that the Club was celebrating its 45<sup>th</sup> year and that *The Festivus* had its 356<sup>th</sup> anniversary of continuous on-time publication.

Following dessert – of chocolate-raspberry cheesecake, Carole called on outgoing president Jules Hertz who thanked the 2005 board and welcomed the board for 2006 to be headed by new president Bill Schneider. Bill received the Club gavel and plaque and predicted a fine year for 2006.

The speaker for the evening, Richard Herrmann, gave a fantastic slide program of his adventures around the world while working with Howard Hall and his underwater team. His slides told the story of his adventures – like being one foot away from a huge shark!! One audience member reflected everyone's opinion when she said, "Why doesn't he give the program every year?"

Following Richard's program there was the excitement of the traditional gift exchange and the drawing for the centerpieces. People lingered to enjoy each other a while longer. The evening ended all too soon.

## SOUTHERNMOST RECORD OF *ZEIDORA BIGELOWI* FARFANTE, 1947, FROM HONDURAS (VETIGASTROPODA: FISSURELLIDAE)

DANIEL L. GEIGER

Santa Barbara Museum of Natural History/Invertebrate Zoology  
2559 Puesta del Sol Road, Santa Barbara, CA 93105  
E-mail: geiger@vetigastropoda.com

*Zeidora* A. Adams, 1860, is a little-known genus in Gastropoda: Vetigastropoda: Fissurellidae: Emarginulinae. All species are of small size and uncommonly found in collections. Species have been recorded from Easter Island (*Z. bahamondei* Rehder, 1980), Japan (*Z. calceolina* A. Adams, 1860: type species; *Z. reticulata* A. Adams, 1862; *Z. limatulaeformis* Horikoshi, 1844), the Panamic (*Z. flabellum* Dall, 1895), Australia (*Z. lodderae* (Tate & May, 1900); *Z. tasmanica* (Beddome, 1883)), New Zealand (*Z. maoria* Powell, 1937), and the Caribbean (*Z. naufraga* Watson, 1883; *Z. bigelowi* Farfante, 1947).

The last species was first collected from Bahía de Cochinos, Cuba, in 17-225 fm and described from two specimens by Farfante (1947). Parker and Curray (1956) listed the species from off Flower Garden Bank, Louisiana. Odé (1988) discussed the species based on four lots. Garcia and Lee (n.d.) list the species as occurring off Louisiana. Emilio Garcia (pers. comm.

8/2005) has two lots from Louisiana: #22246, In: 28°0.561'N, 91°2.205'W Out: 28° 05.524 N, 91° 02.036'W - dredged in 58 m (May 27, 2000); and #23439: 28°06.066'N; 91°2.418'W - dredged in 57-65 m in coral rubble (June 30, 2001). Malacolog (<http://data.acnatsci.org/wasp/index.php>) provides distribution limits from 22-27.9°N and 81-93.8°W at depths from 33 - 411 m. The species can be recognized by its relatively long slit and rather short shelf compared to the sympatric *Z. naufraga*.

A sediment sample collected by Peggy Williams on July 4, 1985, from Cochino Pequeño, Little Hog Island, Bay Island, Honduras [15°57'N, 86°30'W], yielded one additional specimen of *Z. bigelowi* (Figure 1). At 2.65 mm it is of moderate size, yet shows the characteristics of the species. The specimen extends the range of the species by seven degrees to the south, thereby more than doubles its known latitudinal distribution. It was found in a sample rich in Fissurellidae, including 75 *Emarginula pumila* A. Adams, 1851, three *E. phrixodes*

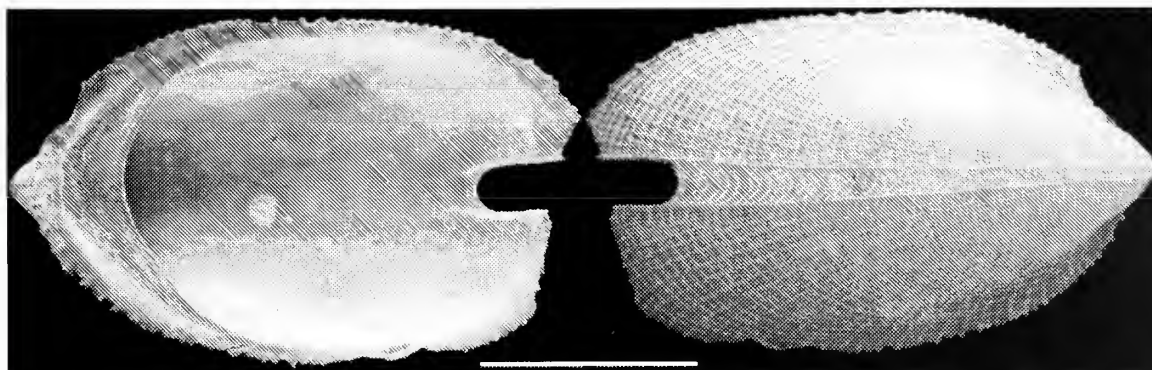


Figure 1. *Zeidora bigelowi* Farfante, 1947, from Honduras (D. L. Geiger collection #361). Uncoated specimen, Zeiss EVO 40 XVP, 100 pa, VPSE detector. Scale bar = 1 mm.

Dall, 1927, six *Puncturella noachina* Linnaeus, 1771, two *Diodora minuta* Lamarck, 1822, four *Hemitoma emarginata* Blainville, 1825, and one cf. *Rimula pycnonema* Pilsbry, 1943.

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## LOW TIDES FOR 2006 AT SAN FELIPE, BAJA CALIFORNIA, MÉXICO

The entries below show periods of low tides of -3.90 feet and below. The times of low tides are given in Pacific Standard Time, except those dates marked with an asterisk are in Pacific Daylight Time. To correct for

Puerto Peñasco add one hour to listed times when they are in Pacific Standard Time. Tides below the midriff of the Gulf cannot be estimated using these entries. All entries are approximate times and tides.

Jan. 28	7:49 pm	-5.16 ft	Mar. 31	9:23 am*	-4:07 ft	Sep. 9	10:08 am*	-4.27 ft
Jan.29	8:31 pm	-5.78 ft	Apr. 26	8:17 am*	-4.37 ft	Sep. 9	10:28pm*	-3.95 ft
Jan. 30	9:11 pm	-5.52 ft	Apr. 27	8:51 am*	-4.84 ft	Oct. 5	7:53 am*	-4.23 ft
Jan. 31	9:53 pm	-4.36 ft	Apr. 28	9:24 am*	-4.61 ft	Oct. 5	8:17 pm*	-4.14 ft
Feb. 26	7:39 pm	-5.45 ft	May 5	8:29 am*	-3.91	Oct. 6	8:32 am*	-4.67 ft.
Feb. 27	8:18 pm	-5.97 ft	Jul. 11	9:17 am*	-4.17 ft	Oct. 6	8:51 pm*	-5.12 ft
Feb. 28	8:56 pm	-5.50 ft	Jul. 12	9:59 am*	-4.32 ft	Oct. 7	9:10 am*	-4.22 ft
Mar. 1	9:21 am	-4.00 ft	Aug. 8	8:28 am*	-4.28 ft	Oct. 7	9:24 pm*	-5.32 ft
Mar. 1	9:33 pm	-4.09 ft	Aug. 9	9:08 am*	-5.21 ft	Oct. 8	9:58 pm*	-4.71 ft
Mar. 27	7:21 pm	-4.69 ft	Aug. 10	9:48 am*	-5.33 ft	Nov. 3	6:50 pm	-4.52 ft
Mar. 28	7:46 am	-4.14 ft	Aug. 11	10:28 am*	-4.57 ft	Nov. 4	7:25 pm	-5.27 ft
Mar. 28	7:59 pm	-4.88 ft	Sep. 6	8:13 am*	-4.77 ft	Nov. 5	8:00 pm	-5.27 ft
Mar. 29	8:19 am	-4.87 ft	Sep. 7	8:52 am*	-5.56 ft	Nov. 6	8:35 pm	-4.53 ft
Mar. 29	8:36 pm	-4.17 ft	Sep. 8	9:30 am*	-5.39 ft	Dec. 3	7:09 pm	-4.38 ft
Mar. 30	8:51 am	-4.84 ft	Sep. 8	9:51 pm*	-4.27 ft	Dec. 4	7:47 pm	-4.40 ft



## ON WEST COAST OCTOPUSES INCLUDING A FIELD KEY TO WEST COAST SPECIES

ROLAND C. ANDERSON

The Seattle Aquarium, 1483 Alaskan Way, Seattle, Washington 98101, USA  
E-mail: roland.anderson@seattle.gov

The Seattle Aquarium has benefitted from the presence of several gifted interns over the last few years. These were generally college students seeking a hands-on experience in some aspect of marine biology that would complement their formal education. Some of them were enrolled in a special program that required them to do an outreach program and sometimes they just took it upon themselves to investigate and make arrangements to work here. Typically the time spent was three weeks to two months during the summer but some spent a college quarter helping us with a special job.

Many wanted to work with octopuses because the Aquarium is known for its octopus research, especially on giant Pacific octopuses. With my help and direction, we arranged for the interns to either do a specific research project of their own or something that would aid my current studies on behavior and enrichment for octopuses. Such projects could be preliminary studies that would contribute to a larger research project or might be observational assignments that could stand alone. In either case, I encouraged the interns to publish the results with my help. I believe these students will continue on in some aspect of biology and be a success, and that having a chance to participate in the publishing process will be a benefit to their future work.

The following two papers in this issue are the results of the research by two of the interns. Daniel Blustein from Kalamazoo College investigated how octopuses can open jars to get at the food inside. Can an octopus open a child-proof pill bottle? Read on to find out. Environmental

enrichment such as this plays a big role in keeping captive animals in zoos, aquariums and laboratories these days. As intelligent animals, octopuses are highly deserving of such enrichment. Eliza Little from McGill University took advantage of a female red octopus guarding eggs to observe the methods the mother uses to keep the eggs clean and how she apportions the time of her brooding behaviors. I hope you find these projects as interesting to read about as I did in working with these exceptional students.

I include here a field key to live U.S. west coast octopuses that I originally constructed to help fishermen and divers who kept asking me to identify the octopuses they were catching, seeing or photographing. This key is a bit different than the standard keys because it is based on the characters of live animals, not preserved museum specimens. Thus, there is no need to kill the animals and look inside them to determine what species they are.

The key is largely based on my own observations but Dr. F. G. Hochberg of the Santa Barbara Museum of Natural History contributed greatly to some of the details and the construction of the key and I thank him for his assistance. Due to changes in taxonomy and the recent contributions of phylogenetics and DNA sequencing, such a key will always be a work in progress and may need revising in the future but the data here presented are the most current available. I welcome any feedback as to its ease of use or improvements.



## FIELD KEY TO LIVE OCTOPUSES OF THE NORTHEASTERN PACIFIC OCEAN

1. Generally deeper than 500 feet..... 2  
     Generally shallower than 500 feet.....4
2. Body gelatinous, arms short, 1 row of suckers.....*Opisthoteuthis californiana*  
     Body not gelatinous, 2 rows of suckers.....3
3. Body covered with low relief tubercles, greenish-yellow skin, ink produced.....*Octopus californicus*\*  
     Body smooth, skin fold running around body, large eyes, ink not produced..... *Benthoctopus leioderma*
4. Generally found Monterey northward.....5  
     Generally found Monterey southward\*\*.....6
5. Animal small (to 1 lb), 3 "eyelashes" under each eye, 2 white spots in front  
     of eyes, body papillae pointed and cylindrical .....*Octopus rubescens*  
     Animal large (to over 400 lb), no "eyelashes" under eyes, 1 white spot centrally  
     located in front of the eyes which makes an equilateral triangle with the eyes, a  
     white streak in the skin from each eye to the base of the 2nd arm on each side,  
     body papillae flat and paddle-like, mantle with deep longitudinal wrinkles .... *Enteroctopus dofleini*
6. Has a dark blue ocellus ("eyespot") below each eye between bases of 2nd and 3rd  
     arms\*\*\*.....7  
     Ocelli absent, animal tiny (to 2 oz), lives in kelp holdfasts..... *Octopus micropyrsus*
7. Iridescent blue ring of ocellus chain-like, eggs large, benthonic larvae, most  
     commonly lives on mudflats, black ink.....*Octopus bimaculoides*  
     Iridescent blue ring of ocellus with radiating spokes, eggs small, planktonic larvae,  
     generally lives on rocks, brown ink.....*Octopus bimaculatus*

\* *Octopus californicus* may be found as shallow as 250 feet.

\*\* Note: both *Enteroctopus dofleini* and *Octopus rubescens* are found south of Monterey but in deeper water.

\*\*\* *Octopus veligero*, with a brown spot in front of the eyes, may be expected in southern California during El Niño years.

## SMART OCTOPUS?

ROLAND C. ANDERSON\* & DANIEL H. BLUSTEIN\*\*

\*The Seattle Aquarium, 1483 Alaskan Way, Seattle, WA 98101, USA

E-mail: roland.anderson@seattle.gov

\*\*Kalamazoo College, Box 40, 1200 Academy Street, Kalamazoo, MI 49006, USA

Octopuses are considered the most intelligent invertebrates (Linden, 2002). They learn simple mazes (Wells, 1978; Boal, 1996), distinguish between shapes and patterns in classical conditioning (Boal, 1991), use landmark navigation while foraging (Mather, 1991b), use tools (Mather, 1994), show play behavior (Mather & Anderson, 1999) and have individual personalities (Mather & Anderson, 1993).

Because of their intelligence, octopuses have become subjects of environmental enrichment in captivity (Anderson & Wood, 2001). Such enrichment for octopuses can take the form of providing live food such as crabs or adding other natural tank inhabitants such as compatible fishes and invertebrates, or giving them complicated environments for exploration (Anderson & Wood, 2001). Other forms of octopus enrichment are what Rehling (2000) calls "prey puzzles" which octopuses solve to get food. An example of a prey puzzle is a crab or other food inside a screw-top jar that the octopus has to unscrew in order to get the food inside. Such enrichments are widely practiced by public aquariums, but Anderson and Wood (2001) caution that as yet there is no method to measure the effects of enrichment on octopuses. However, Dickel et al. (2000) have proven enrichment to be beneficial to cuttlefish which are also cephalopods like octopuses. Because octopuses are intelligent, enrichment should be provided to them in captivity (Anderson & Wood, 2001).

During the second annual Octopus Week celebration at the Seattle Aquarium (February 14-22, 2003), enrichment demonstrations proved popular with the public (Anderson, 2003). The female giant Pacific octopus (*Enteroctopus dofleini*) on display ("Pandora") proved particularly adept at opening jars with screw-top lids. She opened the first in just 15 minutes and later presentations of this puzzle took her an average of two minutes to open. Some octopuses seem better at these prey puzzles than others owing to their differing

temperaments (Sinn et al., 2001).

On the basis of the results above, it was decided to further challenge a female giant Pacific octopus ("Billye") by giving raw herring pieces inside a child-proof pill bottle (Figure 1). Because octopuses taste with their suckers (Wells, 1963), several holes were drilled in a 480 ml pill container to allow the octopus to sense the presence of food within. To open the lid it was necessary to push down on the lid at the same time



Figure 1. Giant Pacific octopus "Billye" accepts a child-proof pill bottle containing herring. She will open the jar and get at the food in a mean time of five minutes.

as turning it and Billye accomplished this task in 55 minutes (Figure 1). It was difficult to tell exactly when the jar was opened because it was enveloped within the animal's eight arms. However, the dropping of the lid by the octopus was used to mark the time of opening of the jar. Further presentations resulted in a decrease of the average opening time to 5 minutes. Presentations to three other octopuses showed similar patterns (Figure 2).

These results do not imply octopuses are smarter than human children but the trouble lies in actually measuring and quantifying octopus intelligence. Our standard methods of measuring intelligence in animals may be anthropocentric and we even have difficulties assuring ourselves that tests measuring human intelligence are accurate or standardized (Beiser & Gotowiec, 2000).

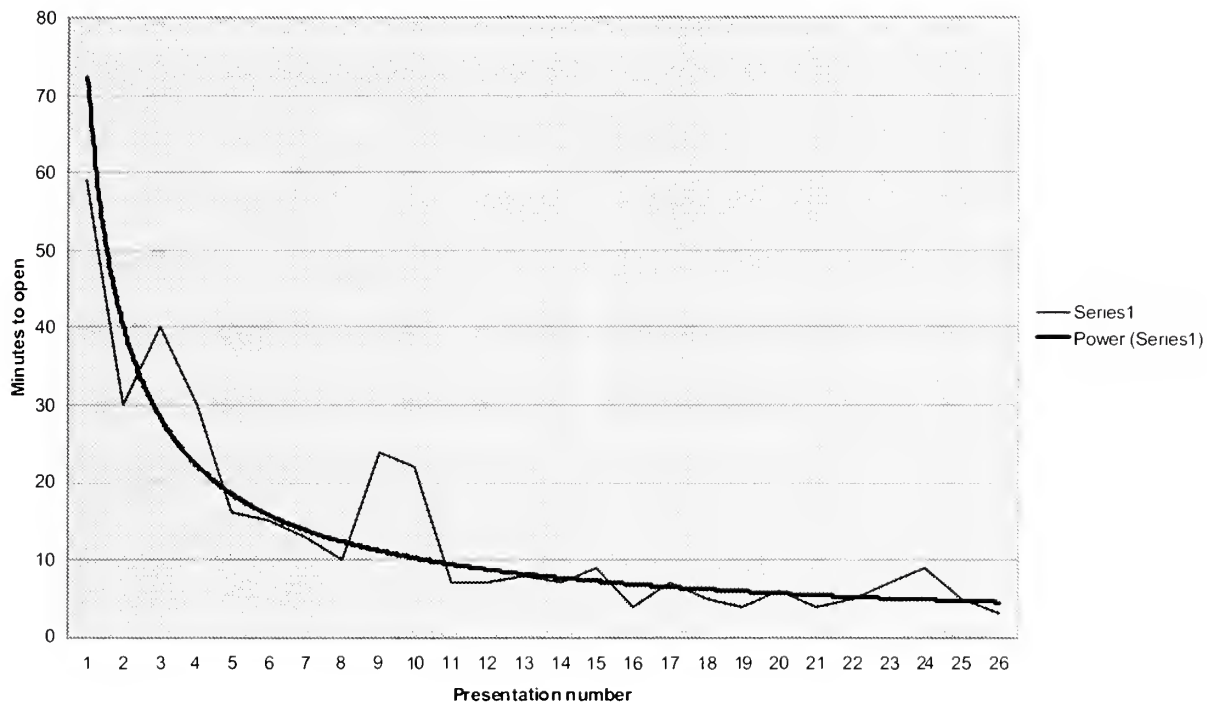
Octopuses are refuting predators (per Curio, 1976), who live in dens and go out to different areas each trip to hunt prey (Mather, 1991a). They do not hunt in the same area each time because it would have been depleted by previous hunts. Therefore, our standard tests of giving food as rewards for turning the same way in a maze or pressing a different shaped or patterned button again and again may not be able to properly assess the true intellectual ability of octopuses.

Also, octopuses do not have a lot of brainpower. Their brains only have about 168 million neurons (Wells, 1962) compared to humans who have about 100 billion (Nolte, 1999), but they may use them more efficiently than we do. Octopuses also have a peripheral nerve system - as much as 50% of their nerves - in their arms (Sumbre, et al., 2001). As yet we do not know if this plays any part in their intelligence but they may allocate motor control to these areas and have more brain capacity remaining for learning. The ancient lineages that led to the ancestors of octopuses and humans diverged more than a billion years ago (Wray, et al., 1996). Thus, observations in octopuses such as this may give us further insight into what Tennesen (1999) called a "different way of thinking."

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Figure 2. Mean and trendline (MS Excel) of four giant Pacific octopuses (*Enteroctopus dofleini*) opening child-proof bottles





## OBSERVATIONS OF A BROODING *OCTOPUS RUBESCENS* (CEPHALOPODA: OCTOPODIDAE)

ROLAND C. ANDERSON\* & ELIZA A.H. LITTLE\*\*

\*The Seattle Aquarium, 1483 Alaskan Way, Seattle, Washington 98101, USA  
roland.anderson@seattle.gov

\*\* 474 Smith Hill Road, Colbrook, Connecticut 06021, USA

### Introduction

*Octopus rubescens* Berry, 1953, generally called the red octopus (Turgeon, et al., 1998), is the most common octopus in the northeastern Pacific Ocean (Hochberg & Fields, 1980). It is a medium-sized octopus growing to 400 g (Hochberg, 1998). In Puget Sound it is reported as living from the intertidal to 300 m (Anderson, 1994). It feeds on crustaceans, gastropods and bivalves (Warren et al., 1974; Dorsey, 1976; Hochberg & Fields, 1980; Anderson et al., 1999). Unlike most other octopuses, it exhibits some social behavior (Dorsey, 1976). Its behaviors have been relatively well-studied (Warren et al., 1974; Dorsey, 1976; Hochberg & Fields 1980; Mather & Anderson, 1993; Osborn, 1995; Anderson et al., 1999) but certain aspects of its life history remain to be determined.

Octopuses are terminal spawners (Rocha et al., 2001). They mate at the end of their lives; subsequently both males and females degenerate although males die first because they take no role in egg guarding. Female *O. rubescens* guard and brood eggs, usually laid on the top of a confined den, frequently a rock crevice or a shell (Strathmann, 1987). Eggs take from two to six months to hatch (Dorsey, 1976; Osborn, 1995) depending on water temperature, during which time she guards and cleans them without eating. She dies shortly after the eggs hatch (Dorsey, 1976).

The brooding behaviors of female octopuses have been described casually, mostly in brief observational descriptions or in behavioral reviews. Females have been described to cradle, caress, rub, shoot water through, and continuously agitate the eggs (Lane, 1957; Giese & Pearse, 1997), and brooding has been described as protection, aeration, and cleaning (Hanlon & Messenger, 1996), prevention against parasitic infection (Osborn, 1995) and consumption (Gabe, 1976; Rocha et al., 2001). In a thesis on the fecundity and embryonic development of *O. rubescens*, a fungal ectoparasite was

noticed on the eggs, which gives credence to the observed continuous brooding by the female (Osborn, 1995). A review of how octopuses use their arms (Mather, 1998) gives a basis for describing arm movements used in brooding behaviors. The key objectives of this study were to define the brooding behaviors, assess the relative frequencies of the behaviors, see to what extent the female broods, and see if her activity is consistent over time.

### Procedures

#### Research Conditions

This study was conducted at the Seattle Aquarium during the month of June 2004. A female octopus was collected by divers underneath the Aquarium on February 2, 2004. She was placed individually on public display for 97 days per Anderson (1997) until eggs were noticed hanging in festoons from the topside of her den, a black plexiglass cube 7.5 cm square, with one open face (Figure 1). The eggs were not counted but seemed typical of the species for a female of her size (Osborn, 1995), 98 g at capture. The water for the Aquarium comes directly from Puget Sound and ranged 11 to 13°C during this study. For purposes of observation, the brooding octopus was moved to an off-exhibit tank at the Aquarium (14 hr day, 10 hr night). Her eggs began hatching 95 days after the first eggs were noticed, whereupon the den, eggs and mother were placed on the bottom of Puget Sound, 10 m deep adjacent to the Aquarium. Two weeks after release, the den was recovered by divers with no sign of the female or eggs inside it.

#### Methodology

Observations (n = 499) of the female were made at

five minute intervals over 42 hours from a stool about 1 meter from the tank. They were conducted over all hours of the day and night, 26 daytime hours and 16 at night. A t-test was used to assess if there was any significant difference between the individual behaviors during day and night per Zar (1999). A video camera was used as a control measure to see if the observer's presence altered the brooding behaviors.

### Brooding Behaviors

Through preliminary observation, six categories of behaviors were set to quantify brooding activity: Not Active (simply guarding, or sleeping) (see Anderson & Mather, 2002) which is associated with loss of color, paling and closure of the eyes, Emerging (the octopus went out of the den), Aeration (jet propelled water by the funnel to aerate the eggs), Arm Snake (the whole arm went through the egg festoons), Tip Feel (the distal tips of the dorsal arms felt individual eggs), and Arm Twirl (a rolling, cleaning movement where suckers rub against each other in a figure eight motion – see Mather, 1998).

### Results

The octopus moved the open face of its den away from the light almost every night. This hindered observation because “away from the light” meant away from the observation post so the den was moved to face the observer each morning. The female octopus was inactive or engaged in non-brooding behaviors approximately 70% of the time observed. She rested (but alert) 17% of the time and slept 14% of the time. The behaviors were consistent over the time observed (Table 1).

To assess if any significant difference between brooding behavior during the day and night exists a t-test comparing the day and night observations was conducted. It showed that the only significant difference in activity between night and day was the Emerging behavior ( $p < 0.001$ ), which occurred much more frequently at night. As a control measure, to see if the presence of the observer affected brooding behavior, a video camera recorded brooding activity for 10 hours day and night. The only behavior that was significantly different between the two methods of observation was the Emerging behavior which occurred more often when she was not directly observed ( $p < 0.008$ ). No actual



Figure 1. The *Octopus rubescens* laid eggs while on display at the Seattle Aquarium in a small black plexiglass box she used as a den. She gathered the artificial “marbles” used as substrate to the mouth of the den in an effort to block it off from view.

brooding behaviors were significantly different while being directly observed.

### Discussion

It was surprising to find that the female spent so much time outside her den at night. Hanlon and Messenger (1996) say that brooding females never leave their dens. It may be that this was an artifact of being kept in captivity. Because we wanted to observe the brooding female's behaviors, we did not put any gravel or rocks in the tank with which she could have blocked the den. (See Figure 1 when she was being kept on display and blocked the mouth of her den with the marbles of the tank substrate.) She may have left the den in search of materials to block the den. Other octopus females such as *Enteroctopus dofleini* (Wülker, 1912) typically close the openings to their dens (Cosgrove, 1993).

The octopus emerged more often when just recorded with the video camera. The presence of the observer could have been a threat to the octopus, but there was no change in her actual brooding behaviors. The tank she was situated in was in a relatively low

human traffic zone, but nevertheless there were people walking by and even stopping and looking at what was going on but again there were no significant differences between the daytime brooding behaviors and the nighttime ones, when there was no human traffic. She was able to bring her brood to successful hatching under these conditions.

Extrapolating the brooding behavior of *O. rubescens* in general from the observations of one individual should be accompanied with a caveat based on evidence that suggests that octopuses have temperaments (Mather & Anderson, 1993). Variation in temperaments may be due to life in differing environments. Accordingly, brooding behavior is subject to differences depending on the temperament exhibited by the individual octopuses and their environment. But we hope that these observations can serve as a basis for further studies on this species and others and the coincidental occurrence of a brooding *E. dofleini* at the Seattle aquarium has allowed such comparative observations (Anderson, in prep.).

### Acknowledgments

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ZAR, J.H.

1999 *Biostatistical Analysis*, 4<sup>th</sup> ed. Prentice Hall, NJ, 662 pp.Table 1. Percentages of day/night behaviors of a brooding female *Octopus rubescens*.

	Not Active*	Emerging	Aeration	Arm Snake	Tip Feel	Arm Twirl
Day	31	0	16	23	16	14
Night	28	8	16	20	16	12

\* Not Active included resting alert and sleeping (eyes closed).

## SAN DIEGO SHELL CLUB ANNOUNCES A SUPER AUCTION - THE BILLEE/TWILA AUCTION

This year the San Diego Shell Club's annual auction/ potluck will be held on Saturday evening April 8<sup>th</sup> at the Summer Hill Clubhouse, 3575 Ruffin Road, San Diego. The auction/potluck will differ from all previous events in that all the material in the voice and silent auctions will be from the Billee Gerrodette and Twila Bratcher-Critchlow Collections which were generously donated to the Club in 2005. It will include books, carvings, corals, and a great collection of beautiful and rare shells.

Among the shells to be auctioned are many species desired by cowrie, cone, murex and volute collectors. For the cowrie collectors there will be marvelous and difficult-to-get species such as *Cypraea hirasei*, *aequinoctialis*, *ostergaardi*, *cassaiui*, *sanctahelenae*, *rashleighana*, *marginata* (white), *spadicea* (white), *aurantium*, *nigropunctata* (Galápagos), *mappa* (white), *jeaniana*, and many more.

For the cone collectors there is a very large *Conus gloriamaris*, *milnedwardsi*, *villipini*, *granulatus*, *dusavelli*, *selenae*, *brasiliensis*, *rainesae*, *bengalensis*, *excavatus*, *aurisiacus*, *aurantius*, *aureus*, *circumactus* and others.

The murex lovers will find *Murex bednalli*, *miyokoeae*, *purdyae*, *rubiginosus*, *pinniger*, *diffusi*, *bequaerti*, *modesta*, *consuelae*, *barclayanus*, *hidalgoi*, among others. There are also some beautiful trophons like *catalinensis*, *cerrosensus*, *beebei* and *bentleyi*. Latiaxis fanciers will enjoy *L. takahashii*, *cristatus*, *spinosus*, *winckworthi*, *dalli*, and *marumai*.

There are many volutes such as *delicata*, *cracenta*, *aulica*, *wisemani*, *magellanica* and *roadnightae* and some marvelous shells in other families as well, such as *Epitonium turbinum* (Galápagos), *Haliotis roberti*, *H. dalli*, *Pecten magnifica* (Galápagos), *Nodipecten langfordi*, and some interesting strombs, miters, cassids, etc. Also to be auctioned will be some world-record sized shells.

Remember to mark April 8<sup>th</sup> on your calendar as a must event!! If you can't come to the auction and you are interested in bidding on some of the shells or need more information, contact Carole or Jules Hertz by phone at (858) 277-6259 or by e-mail at <cmhertz@pacbell.net>. They will also be happy to arrange for someone to do your bidding on selected items up to your pre-set top limit.



The Festivus.

American Museum of Natural  
History

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

The Beauty of the Shell: New Discoveries on the Paleontology and Evolution of Shelled Opisthobranch Mollusks

Dr. Ángel Valdés, curator of mollusks at the Natural History Museum of Los Angeles County (LACM), and specialist in opisthobranchs, will give a PowerPoint presentation featuring the shelled mollusks of the Opisthobranchia.

Meeting date: February 16, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting January 19, 2006

The meeting was called to order at 7:45 p.m. by President Bill Schneider who welcomed members and guests to the first meeting of the year. The minutes of the October meeting were approved as published in *The Festivus*. Treasurer Silvana Vollero and Program Chairman John LaGrange gave their reports and Carole Hertz updated the membership on the plans for the Billee/Twila Auction/Potluck on April 8<sup>th</sup>.

Then Past President Jules Hertz made the presentation of an honorary Club membership to Charter Member Billee Gerrodette to the applause of those attending. This is only the third honorary membership awarded in the Club's history (p. 21).

John LaGrange then introduced the speaker for the evening, Dr. John Butler of the National Marine Fisheries who gave an exciting PowerPoint presentation featuring images he'd taken from an ROV in water to over 400 meters depth from Point Conception to 60 Mile Bank. Colorful images of beautiful fishes and other strange and wonderful sea creatures were greatly enjoyed by the attendees.

Although John thought that the only mollusks he'd photographed were octopods (*Octopus californiensis* was photographed at 414 meters in Scripps Canyon), some members did their armchair collecting and found several species of *Calliostoma* at these depths.

Following the excellent presentation the meeting was adjourned at 8:45 p.m. John Bishop won the door prize and members and guests enjoyed a social time with refreshments provided by the Goldammers and the Hertzes.

Carole Hertz

### *The Festivus has a new supplement: Comprehensive Index to The Festivus 1970-2005*

*The Festivus* has now published another supplement which is an index from 1970, its first issue, through 2005. The 44-page index "is a compilation of the papers and articles as well as supplements and occasional papers which have

appeared monthly ..." since the publication's inception in 1970. The index is arranged both by author and by key words.

This supplement is now available to interested parties for \$ 10.00 postpaid domestic; \$12 (Mexico & Canada) postpaid airmail and \$15.00 postpaid overseas airmail.

If you are interested in receiving the index, contact editor Carole Hertz <cmhertz@pacbell.net> or write to her at the Club address on the front page.

### *Latiaxis Lovers – Have we got Shells for You!!*

This year's annual auction/potluck will have a large number of beautiful frilly or spiny species of *Latiaxis* and related groups for bidding. Past auctions of the San Diego Shell Club have had an occasional lot of *Latiaxis* but never the quantity found in the Billee Gerrodette and Twila Bratcher-Critchlow collections. Those of you interested will be able to view and bid on *Latiaxis pilsbryi*, *tosanus*, *deburghiae*, *winckworthi*, *eugeniae*, *pagodus*, *dalli*, *kinoshitae*, *cristatus*, *santacruzensis*, *mawae*, *marunai*, *lischkeanus*, *oldroydi*, *dunkeri*, and *takahashi*. If you want to specialize in collecting shells of a beautiful group, attending this auction and bidding vigorously is a perfect opportunity. Those of you interested in this group, probably already have the 1985 book *Illustrated Catalogue of Latiaxis and Its Related Groups Family Coralliophilidae* by Sadao Kosuge and Masaji Suzuki. In case you don't, we will also have the book in the auction.

The auction/potluck will be held on 8 April 2006 at the Summer Hill Clubhouse, 3575 Ruffin Road, San Diego, the same place that we have used for many years. All the material in the voice and silent auctions are from the Gerrodette and Bratcher-Critchlow collections. In addition to the large variety of *Latiaxis*, there will be a great collection of species, many rare, of other favorite groups, such as: cowries, cones, volutes, muricids and strombs. We will also have land snails, books, corals and other items of interest for auction.

If you cannot attend but would like to participate, contact Carole or Jules Hertz at 858-277-6259 or e-mail at <cmhertz@pacbell.net>. We can give you more information on the items to be auctioned and can even provide someone to bid for you. All proceeds from the auction/potluck are used to fund *The Festivus*. We hope you can attend and make the event a great success. Besides the opportunity to bid, the auction/potluck is a fun event - so plan to attend even if you are not interested in bidding.

## HYPOTHESIS FOR THE RECOGNITION OF *NUCELLA ANALOGA* (FORBES, 1852) IN THE NORTHEASTERN PACIFIC

JAMES H. MCLEAN

Natural History Museum of Los Angeles County  
900 Exposition Boulevard, Los Angeles California, 90007, USA  
E-mail: jmclean@nhm.org

**Abstract.** Based on differences in shell morphology and habitat, *Nucella canaliculata* of previous authors is considered to represent a complex of two species, the more northern *N. canaliculata* (Duclos, 1832), feeding chiefly on barnacles in intertidal habitats swept by tidal currents, and the more southern *N. analoga* (Forbes, 1852), feeding on mussels in surf-exposed zones. Distributions of the two species overlap in southeastern Alaska and Washington. This hypothesis should be tested by means of molecular genetics.

### Introduction

Species of the genus *Nucella* are abundant predatory whelks along the rocky intertidal shores of the northeastern Pacific. Feeding and other aspects of their biology have been well studied. Five northeastern Pacific species have been recognized: *canaliculata* Duclos, 1832; *emarginata* Deshayes, 1839; *lamellosa* Gmelin, 1791; *lima* Gmelin, 1791; and *ostrina* Gould, 1852.

The species *ostrina* was recently distinguished from *emarginata* by Marko, Palmer, and Vermeij (2003), building upon earlier work by these authors cited therein. In addition to genetic differences, the two species have subtle morphological differences. The two species overlap in their distributions between Half Moon Bay, San Mateo County, and Point Conception, Santa Barbara County, California, the species *ostrina* ranging north to the Bering Sea and the species *emarginata* ranging south to central Baja California.

Molecular genetics in the species *Nucella canaliculata* has only recently been studied. Sanford et al. (2003) examined 16 populations of *N. canaliculata* from broadly spaced, wave exposed sites between Tatoosh Island, Clallum County, Washington, to Piedras Blancas, San Luis Obispo County, California. They found that their genetic data for COI ("mitochondrial gene encoding cytochrome c oxidase subunit I") showed low gene flow, but their results "suggest neither a phylogeographic split between southern and northern populations, nor the presence of a cryptic species."

That conclusion is not in agreement with my impression of the shell character variation shown by the *Nucella canaliculata* species complex throughout its entire distribution from the Aleutian Islands, Alaska, to southern California. My hypothesis is that the broad-ranging species known as *N. canaliculata* represents another complex of two species, with the true *N. canaliculata* (Duclos, 1832), being a more northern species that extends to the Aleutian Islands, Alaska, and south at least to Puget Sound, Washington, and that a second, more southern species *N. analoga* (Forbes, 1852), ranges from Prince William Sound, Alaska, to Santa Barbara County, California, with substantial overlap of the two species in southeastern Alaska, British Columbia, and Washington. The name *analoga* Forbes is a familiar name that has been mentioned in the literature as a synonym of *N. canaliculata*, to which it was assigned by Dall (1915), followed by Abbott (1974: 182). The usage of the name *analoga* was introduced for fossil specimens of the species (based on a personal communication from me) by Vermeij & Powell (2004: 186) in a report on the Pliocene members of the group.

My hypothesis is based both on shell morphology and habitat differences between the two species in the complex. If my conclusions are confirmed by molecular evidence, the species of common occurrence between Washington state and San Luis Obispo County, California, for which feeding has recently been studied by Navarette & Menge (1996), Weiters & Navarette (1998), and Sanford et al. (2003), should be known as



*Nucella analoga*, rather than *N. canaliculata*. It is hoped that this will encourage genetic studies on material from British Columbia and Alaska for comparison with genetic work by Sanford et al. (2003) on U. S. populations of the species here determined as *analoga*.

Museum abbreviations: LACM, Natural History Museum of Los Angeles County; MNHN, Muséum National d'Histoire Naturelle, Paris; ZISP, Zoological Institute, Saint Petersburg, Russia.

### Systematics

Family MURICIDAE Rafinesque, 1815  
Subfamily OCENEBRINAE Cossmann, 1903  
Genus *Nucella* Röding, 1798

Dall (1915) illustrated variation for each of the northeastern Pacific species now known in the genus *Nucella*. Four names apply to the *canaliculata* complex: *canaliculata*, *analoga*, *decemcostata*, and *compressa*; other names in Dall's synonymy are clearly based on misidentifications. All four were well figured when first proposed. Original illustrations were copied for the three oldest names by Tryon (1880) in the Manual of Conchology, Vol. 2.

#### *Nucella canaliculata* (Duclos, 1832)

Figures 1-4

*Purpura canaliculata* Duclos, 1832: 104, pl. 1, f. 1 (type material 2 syntypes in MNHN; type locality: "California") [original illustration copied by Tryon, 1880, pl. 53, fig. 156].

*Purpura decemcostata* Middendorff, 1849: 445, pl. 9, f. 1-3 (holotype in ZISP; type locality "Bering Strait") [original illustration copied by Tryon, 1880, pl. 53, fig. 161]. A photograph of the holotype of *Purpura decemcostata* was provided for me by the late Dr. O. Scarlato of ZISP in the 1970s.

Illustrations here identified as *canaliculata*: Dall (1915: fig. 3) [same figure copied by Oldroyd, 1927, pl. 35, fig. 3, and again by Abbott, 1974, fig. 1904]; Kozloff (1996: 330, fig. 12.69, as *canaliculata*).

Diagnosis: With strongly projecting spiral cords, 5 above final lip, about 11 in final whorl opposite aperture, with deeply channeled, sharply angulate interspaces; intercalary cords lacking. Shell height 25-40 mm.

This is characterized by its angulate cords and

sharply channeled interspaces.

Habitat: Intertidal in protected inlets and small islands exposed to strong tidal currents (67 LACM lots). I have collected the species *canaliculata* from Kachemak Bay, and Kodiak Island, Alaska, where there are strong tidal currents.

Distribution: Aleutian Islands, Alaska, to Fidalgo Island, San Juan Islands, Washington.

#### *Nucella analoga* (Forbes, 1852)

Figures 5-11

*Purpura analoga* Forbes, 1852: 273, pl. 11, f. 12 (type material not located; type locality: "California") [original illustration copied by Tryon, 1880, pl. 53, fig. 157].

*Thais (Nucella) canaliculata* var. *compressa* Dall, 1915: 569, pl. 74, fig. 2 [holotype USNM 60102; type locality: Monterey, California].

Illustrations here identified as *analoga*: Dall (1915, fig. 1, from Lituya Bay, Alaska, USNM 220974) [same figure copied by Oldroyd, 1927, pl. 35, fig. 1, as "*Thais canaliculata analoga*", and again by Abbott, 1974, fig. 1904a]; Vermeij & Powell (2005, fig. 1 e-f, "Pliocene, Merced Formation, at Seven Mile Beach, San Mateo County, California").

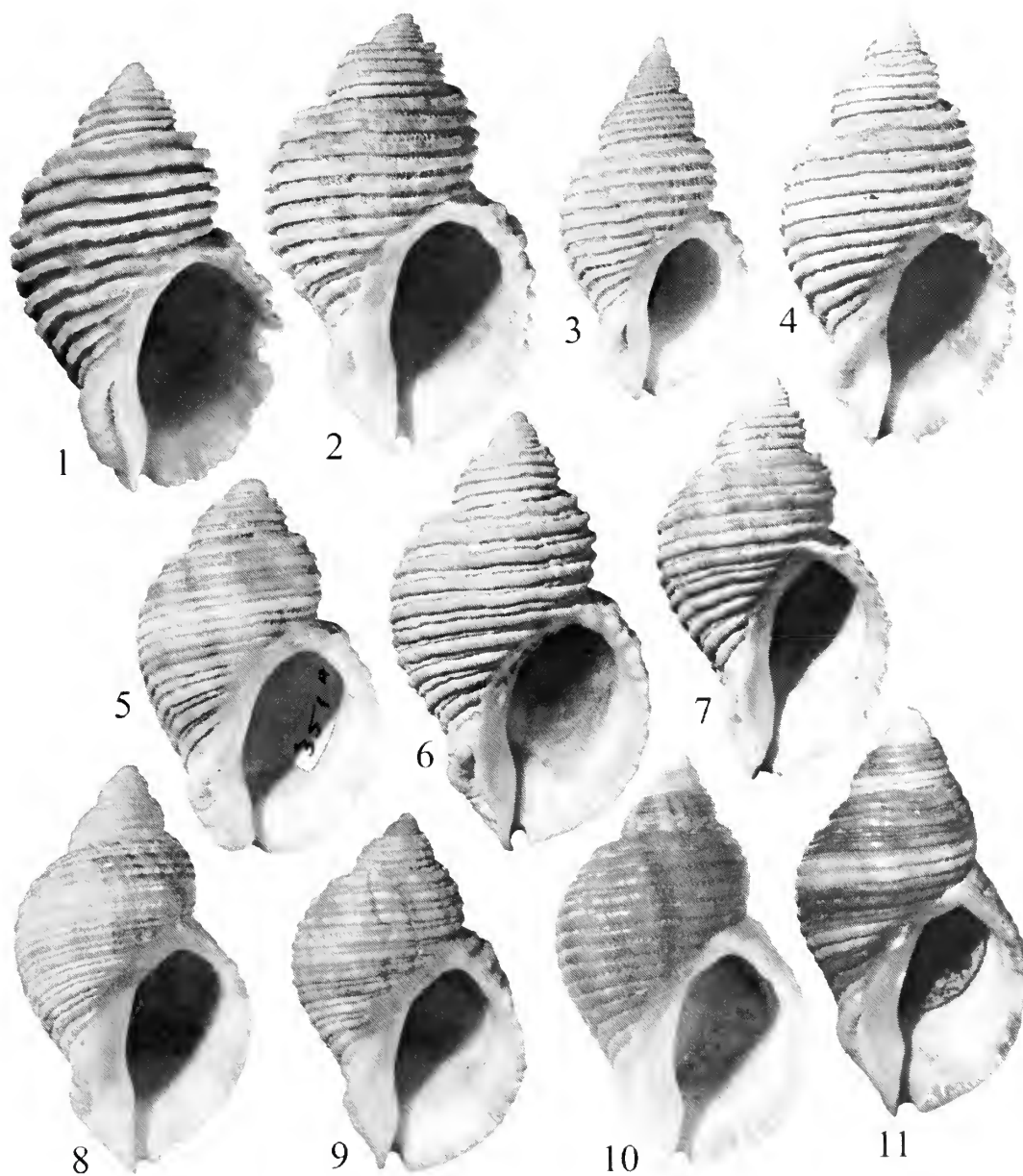
Illustrations here identified as *analoga* subspecies or form *compressa*: Oldroyd (1927, pl. 29, fig. 2, copy of Dall's original); Abbott (1974, fig. 1904b, again of Dall's original) Abbott & Haderlie (1980: 282, fig. 13.82, as *canaliculata*).

Diagnosis: With weakly projecting primary spiral cords, about 6 above final lip, about 12 in final whorl opposite aperture, interspaces shallow, not angulate; intercalary cords usually present between primary cords; intercalary cords more concentrated on basal part of whorl. Shell height 25-35 mm.

Comparisons: This differs from *N. canaliculata* in its less prominent primary cords and in having the interspaces filled with numerous intercalary (secondary) cords.

Efforts to locate type material of *Purpura analoga* were unsuccessful. It is not at the British Museum (A. Salvador, personal communication), nor is it at the National Museum of Scotland, where some material of Forbes is known (S. Pye, personal communication).

Specimens from Northern California, and particularly from the Monterey Peninsula to San Luis Obispo County (Figures 10, 11) have broad, low cords with narrower interspaces, without intercalary cords.



**Figures 1-4.** *Nucella canaliculata* (Duclos, 1832). (1) "California," syntype (MNHN); height 35.7 mm. (2) Seldovia, Kachemak Bay, N coast of Kenai Peninsula, Alaska (LACM 86-283.1); height 38.4 mm. (3) Nigei Island, off NE end Vancouver Island, British Columbia (LACM 63-32.9); height 28.4 mm. (4) Fidalgo Island, San Juan Islands, Puget Sound, Washington (LACM 60625); height 34.4 mm.

**Figures 5-11.** *Nucella analoga* (Forbes, 1852). (5) Cape Suckling, E of Cordova, Prince William Sound, Alaska (LACM 160687); height 29.5 mm; specimen beachworn. (6) Sitka, southeastern Alaska (LACM 160686); height 37.0 mm. (7) Yakun Point, N tip Graham Island, Queen Charlotte Islands, British Columbia (LACM 72-142); height 31.4 mm. (8) Cape Scott, Vancouver Island, British Columbia (LACM 68-71.11); height 32.7 mm. (9) Crescent City, Del Norte County, California (LACM 34243); height 24.8 mm. (10) Pacific Grove, Monterey Peninsula, California (LACM 61785); height 35.1 mm. (11) Port San Luis, San Luis Obispo County, California (LACM 60618); height 32.7 mm.

This is subspecies or form *compressa* Dall, 1915. It could be argued that there are two geographic subspecies: *Nucella analoga analoga* and the more southern *N. analoga compressa*, the latter with broader cords and narrower interspaces than those of *analoga analoga*.

Habitat: This species (as *N. canaliculata*) is considered to be the subject of three recent papers on feeding, that of Navarette & Menge (1996), Weiter & Navarette (1998), and Sanford et al. (2003), all of which dealt with populations on the exposed coast with feeding on intertidal mussels. I have personally collected the *compressa* form among surf-exposed mussels at Carmel and south to Point Sur, Monterey County, California.

Distribution: Prince William Sound, Alaska, to Pt. Sal State Beach, Santa Barbara County, and San Nicolas Island, California; intertidal in mussel beds on exposed coast (107 LACM lots).

### Discussion

The conclusions of Sanford et al. (2003) that they found no "phylogeographic split between southern and northern populations" suggests to me that they considered only the species here identified as *N. analoga*, which is the species expected in wave-exposed sites with mussel beds.

However, Sanford et al. (2003) made no comment on the shell character differences shown by the more southern form *compressa*, in which all cords are low and even. Their finding of no molecular differences between the two forms does not lend support to a taxonomic distinction between these two forms.

Based on my experience in collecting the two supposed species and information on museum locality labels, there is some indication that the two species live in different habitats: the species *canaliculata* lives exposed to tidal currents along inlets and other protected areas, whereas the species *analoga* lives near mussels in surf-exposed habitats.

It is hoped that future molecular work will help to further clarify the distinctions between the two species.

### Acknowledgments

Illustrations of shells were improved in PhotoShop by Michelle Schwengel and assistance with library and curatorial tasks was provided by Lindsey Groves, both of the LACM Malacology Section. I thank Peter Marko, Gary Vermeij, and Eric Sanford for comments. Helpful

suggestions on the manuscript were provided by Gene Coan and Lindsey Groves. I thank Virginie Heros and Delphine Brabant, MNHN, for the image of the type material of *N. canaliculata* (Duclos, 1832). I also thank A. Salvador and S. Pye for their efforts to locate type material of *N. analoga*.

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## HONORARY CLUB MEMBERSHIP AWARDED TO BILLEE GERRODETTE

The San Diego Shell Club has awarded an honorary membership to Billee Gerrodette. The award was presented at the January meeting (Figure 1). This is only the third time in the history of the Club that such an award has been made. Previous recipients have been Dr. Rudolph Stohler and John Souder.

Billee is the only active member of the Club that is an original Charter Member. She and some 50 others founded the Club in 1961. In 1963 Billee was the Club's Editor; this was during the period when the Club provided inputs to the *News of the Western Association of Shell Clubs*. Billee was Vice-President of the Club in 1964, President in 1965, and Vice-President again in 1977. For many years she was on the telephone committee, and once a month members could expect her call announcing the upcoming Club meeting with reminders to attend. She wrote quite a few articles for *The Festivus*, particularly in the early years. She was always supportive of the Club and was an active donor to the Club's annual auction/potluck.

In 2005 she chose to donate her entire shell collection to the Club because she wanted friends to be able to enjoy her shells. The material in this collection will provide a substantial part of the Club's annual auction for many years to come.

In honor of Billee and her sister Twila, this year's auction will be the Billee/Twila auction with all material auctioned from their collections only.



Figure 1. Past President Jules Hertz awarding Honorary Membership plaque to Billee Gerrodette at the January 19<sup>th</sup> club meeting.



## ADDITIONAL MOLLUSK SPECIES FROM ROCAS ALIJOS, MÉXICO

KIRSTIE L. KAISER<sup>1</sup>

Research Associate, Natural History Museum of Los Angeles County,  
900 Exposition Blvd. Los Angeles, California 90007, USA  
E-mail: klkaiser@prodigy.net.mx

Rocas Alijos are wave-worn remnants of a small volcano arising from deep water off Baja California Sur, México and lie in a transitional region between the temperate Californian and the tropical Panamic provinces. Located at 24°57'36''N, 115°45'54''W, Rocas Alijos is 185 nautical miles due west of Cabo San Lázaro and Bahía Magdalena. I consider this small outcropping, made up of three main volcanic stacks, to be the most northern arrangement of the oceanic island groups in the tropical eastern Pacific.

In the book *Rocas Alijos* (1996) edited by R. W. Schmieder, McLean and Coan compiled an extensive list of the marine mollusks collected at Rocas Alijos during the multi-faceted, scientific Cordell Expedition of October-November 1990. The molluscan fauna showed greater affinity to the Californian Province and the total number of mollusk species reported to date by McLean & Coan (1996), (165) and Schmieder (1996), (5) totals 170.

During a very brief visit to the remote Rocas Alijos on 30 September 2004, Alicia Hermosillo and Pedro Medina Rosas observed and collected mollusks, plus a small amount of grunge that was shaken into a bag and later sorted. They used SCUBA and were working in depths of 5-18 m (17-60 ft) during very rough sea conditions which seem to be the norm there.

Among the material were two prosobranch species that are common in the Panamic Province and not

previously reported at Rocas Alijos: *Mancinella speciosa* (Valenciennes, 1832) and *Conus (Stephanoconus) nux* Broderip, 1833, (K.L. Kaiser Collection), shown in Figures 1-2. The one opisthobranch mollusk which was observed but not photographed or collected, *Elysia hedgpethi* Marcus, 1961, is shown in Figure 3 by a representative image.

## Acknowledgments

Muchas gracias to my diving buds Alicia and Pedro for collecting the Alijos specimens and data. Many thanks to Patricia Sadeghian of the Santa Barbara Museum of Natural History who photographed and provided Figures 1 and 2 and to Alicia Hermosillo who supplied the representative image in Figure 3. Jules Hertz was kind enough to sort the grunge sample, my thanks to him.

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<sup>1</sup>Mailing address: Pasco de las Conchas Chinas #115, Depto. 4, Fracc. Conchas Chinas, Puerto Vallarta, Jalisco, C.P. 48390, México.

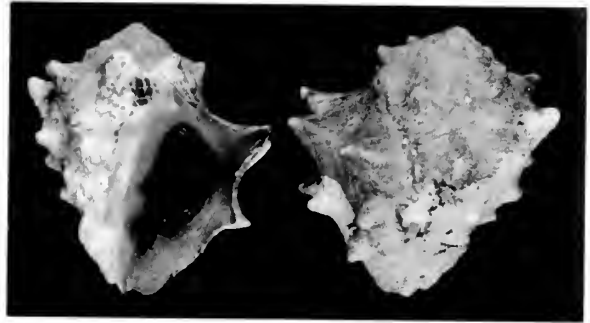
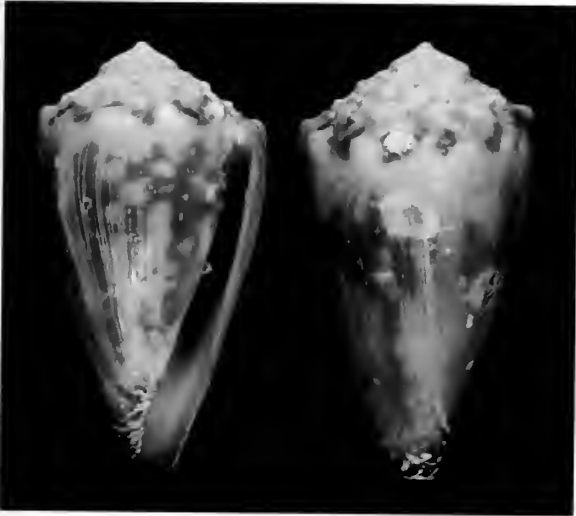


Figure 1 (left) *Conus (Stephanoconus) nux* Broderip, 1833, 19.6 mm, collected living using SCUBA at Rocas Alijos. Photo: Patricia Sadeghian.

Figure 2 (above). *Mancinella speciosa* (Valenciennes, 1832), 33.6 mm, collected live using SCUBA at Rocas Alijos. Photo: Patricia Sadeghian.

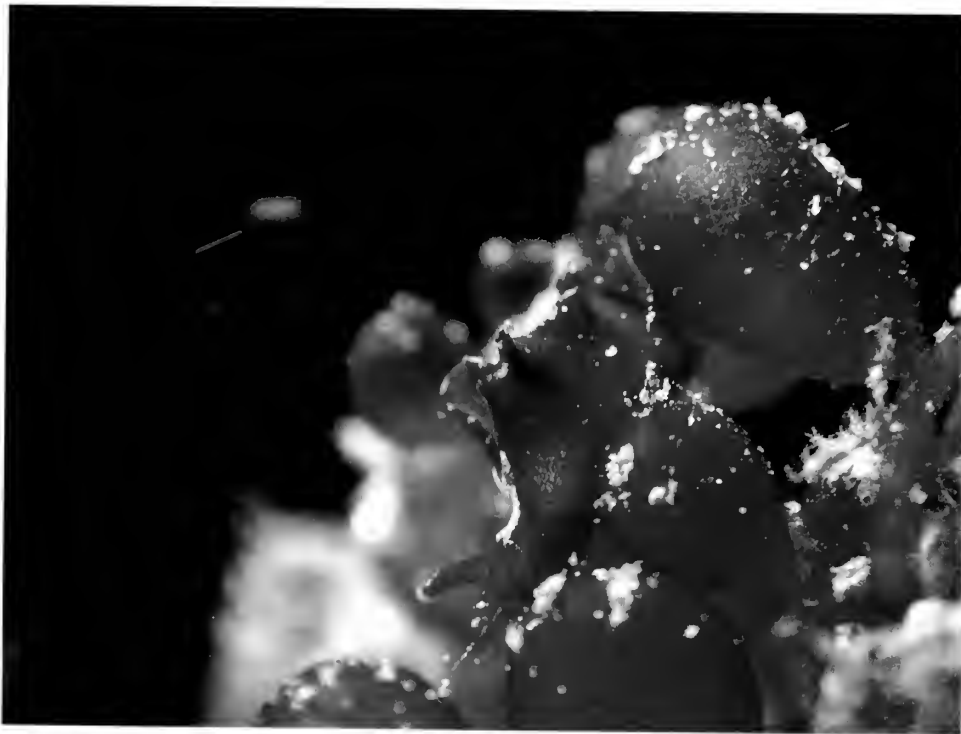


Figure 3. *Elysia hedgpethi* Marcus, 1961, a photo representative of a specimen observed at Rocas Alijos by Alicia Hermosillo. Photo: A. Hermosillo.



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ARNOLD, TERRY, 2975 B St., San Diego, CA 92102, (619) 235-8181, FAX (619) 235-0016, E-mail: tarnold@computer.org

BARNEY, WINSTON, 2801 Clary, Fort Worth, TX 76111-4326, E-mail: wharney@spindle.net

BARWICK, KELVIN L., City of San Diego, EMTS Laboratory, 2392 Kincaid Rd., San Diego, CA 92101-0811, (619) 758-2337, E-mail: kbarwick@sandiego.gov

BERSCHAUER, DAVID & FELICIA, 25461 Barents St., Laguna Hills, CA 92653, (949) 581-9979 (home), (949) 457-9210 (work), FAX (949) 457-9450 (work), E-mail: dpb@berschauerlaw.com

BIELER, RÜDIGER, Field Museum of Natural History, Dept. of Zoology, 1400 S. Lake Shore Dr., Chicago, IL 60605-2496, (312) 665-7720, E-mail: bieler@fieldmuseum.org

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BISHOP MUSEUM LIBRARY, 1525 Bernice St., Honolulu, HI 96817-2704, (808) 848-4148, E-mail: bjshort@bishopmuseum.org

BOWER, KATHY, 224 Stanley Dr., Santa Barbara, CA 93015, (805) 886-6919, FAX (805) 563 4376, E-mail: Kathy.Bower@ventura.courts.ca.gov

BOYD, EDWARD, 18218 Paradise Mountain no. 197, Valley Center, CA 92082-7000, (760) 749-9033, E-mail: patsyboyd@webtv.net

BRATCHER-CRITCHLOW, TWILA & TOM, 7544 La Jolla Blvd. # T15, La Jolla, CA 92037, (858) 456-7241

BROWN, CHRIS, 4575 N. Ave. del Cazador, Tucson, AZ 85718, (520) 299-1890, E-mail: flashcove@mindspring.com

BURCH, TOM & BEATRICE, 3599 Sylvan Pines Circle, Bremerton, WA 98310-6841, (360) 373-1299, FAX (360) 373-1323, E-mail: taburch@comcast.net

CADIEN, DONALD B., 1006 W. 37th St., San Pedro, CA 90731, (310) 833-0312, E-mail: musicmr@cox.net

CALIFORNIA ACADEMY OF SCIENCES, J.W. Mailliard Jr, Librarian, 875 Howard St., San Francisco, CA 94103-3009

CATARIUS, LARRY, 4173 Galt St., San Diego, CA 92117, (858) 270-4376, E-mail: catarius@sbcglobal.net

CHANEY, BARBARA, 1633 Posilipo Lane, Santa Barbara, CA 93108, (805) 969-1434

CHANEY, HENRY W., 170 La Vista Grande, Santa Barbara, CA 93103, (805) 682-4711 ext. 150 (work), FAX (805) 963-9679 (home), E-mail: hchaney@sbnature2.org (work)

CLARK, ROGER N., 1839 Arthur St., Klamath Falls, OR 97603-4617, (541) 883-7582, E-mail: insignis@charter.net

CLOVER, PHILLIP W., P.O. Box 339, Glen Ellen, CA 95442-0339, Phone/FAX (707) 996-6960, E-mail: clovershells@juno.com

COAN, EUGENE V., 891 San Jude Ave., Palo Alto, CA 94306-2640, (650) 493-8242 (home), (415) 977-5681 (work), FAX (415) 977-5790, E-mail: gene.coan@sierraclub.org

COOK, BUNNIE & GEORGE, 1120 Makaiwa St., Honolulu, HI 96816, (808) 737-8050, E-mail: g.-b.cook@juno.com

DAUGHENBAUGH, JOHN, 203 N. Wilton Pl., Los Angeles, CA 90004-4025, (213) 614-4460, E-mail: shoduffy@attbi.com

DEEMS, RON, 1768 Hermes, San Diego, CA 92154-2814, (619) 424-3750

DEFOORT, SABINE, Bookstore Justus Lipsius, BVBA, Belgicalaan 35, 1080 Brussels, Belgium, 32 2 425 05 20, FAX 32 2 425 50 33, E-mail: bookstorejustuslipsius@planetinternet.be

DES CHAINE, LEWIS, 3029 Silver Lake Rd., St. Anthony, MN 55418-2435, (612) 789-4070

DOI, MATTHEW S., 16209 Taylor Ct., Torrance, CA 90504-1902, (310) 329-3201

DULLAS, NORMA M. & WILLIAM, 13231 North 65th Dr., Glendale, AZ 85304, (623) 979-8758, E-mail: norbidullas@aol.com

EERNISSE, DOUGLAS J., Dept. of Biological Science, MH 282, California State University, Fullerton, CA 92834-6850, (714) 278-3749, FAX (714) 278-3426, E-mail: deernisse@fullerton.edu

EMERSON, WILLIAM K., 10 E. End Ave. Apt. 18E, New York, NY 10021-1184, (212) 879-7645 (home), (212) 769-5714 (work), FAX (212) 879-7645, E-mail: emerson@AMNH.org

EVERSON, GENE, 500 Nottingham Pkwy., Louisville, KY 40222-5026, (502) 429-5788, E-mail: supersheller@insightbb.com

FARMER, WES, 3591 Ruffin Rd. #226, San Diego, CA 92123-2561, (858) 576-2143, E-mail: wmfarmar@adnc.com

FLENTZ, MARY & JOHN B., 4541 Lambeth Court, Carlsbad, CA 92010, (619) 434-2522, E-mail: jbflemtz@adelphia.net

FORSYTH ROBERT, P.O. Box 3804, Smithers, British Columbia, Canada VOJ 2N0, (250) 847-6699, E-mail: r.forsyth@telus.net

FRANK, WILLIAM M., 1865 Debutante Dr., Jacksonville, FL 32246-8645, Phone/FAX (904) 724-5326, E-mail: bill@jaxshells.org

GARCÍA, EMILIO F., 115 Oak Crest Dr., Lafayette, LA 70503, (337) 232-2662, E-mail: efg2112@louisiana.edu

GARFIELD, JUDY, Biotext, P.O. Box 332, La Jolla, CA 92038-0332, (858) 643-1113, FAX (858) 483-8140, E-mail: jgarfield@ucsd.edu

GERRODETTE, BILLEE L. & GEORGE, 939 Coast Blvd. #15H, La Jolla, CA 92037, (858) 454-5788

GILBERTSON, LANCE, 1806 Dover Dr., Newport Beach, CA 92660-4419, (714) 432-5847, E-mail: lngilbert@gmail.com

GOLDAMMER, MARILYN & JIM, 10051 Shcaba Way, San Diego, CA 92129, (858) 484-0575, E-mail: mgoldammer@san.rr.com

GORI, SANDRO, Via Sernesi 7, 57123 Livorno, Italy

GREEN, DAVE, LUCILLE & KRISTEN, 6610 Baker Ct., Colleyville, TX 76034, (817) 421-6887, E-mail: dgreen803@comcast.net

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HERRMANN, RICHARD & GINNY, 12545 Mustang Dr., Poway, CA 92064, (858) 679-7017, FAX (858) 679-3346, E-mail: rherrmann@cox.net

HERTZ, JULES & CAROLE M., 3883 Mt. Blackburn Ave., San Diego, CA 92111, (858) 277-6259, E-mail: cmhertz@pacbell.net

HEWITT, SUSAN & EDWARD SUBITSKY, 435 E. 77th St. Apt. 3G, New York, NY 10021, (212) 628-6706, E-mail: hewsub@earthlink.net

HICKMAN, CAROLE S., Z001, University of California, Dept. of Integrative Biology, Berkeley, CA 94720-3140, (510) 642-3429, FAX (510) 642-1822, E-mail: caroleh@socrates.berkeley.edu

HOLLMANN, MICHAEL, Stockumer Heide 44, D-58454 Witten, Germany, 02302-944-255, FAX 0234-230-4225, E-mail: Michael.Hollmann@ruhr-uni-bochum.de



HOLZE, GORDON H., 13201 N. Route 91, Dunlap, IL 61525-9747

HOUSTON, ROY S., Dept. of Biology, Loyola Marymount University, Loyola Blvd. at West 80th St., Los Angeles, CA 90045, (213) 642-3126 (work), (310) 329-6444 (home), E-mail: rhouston@lmu.edu

JACKSON, JOHN A., 11558 Rolling Hills Dr., El Cajon, CA 92020, (619) 579-8405, FAX (619) 579-7901, E-mail: odyssey@adnc.com

JOFFE, ANNE, 1157 Periwinkle Way, Sanibel Island, FL 33957, (941) 472-3151, FAX (941) 472-3153, E-mail: sanibelchiton@aol.com

JONES, SETH J., c/o Jackie Jones, 13220 Occidental Rd., Sebastopol, CA 95472, E-mail: sjones@merkelinc.com

JORDAN, SCOTT, 1528 La Riata Drive, La Habra Heights, CA 90631, (562) 903-0287, FAX (562) 903-1268, E-mail: sjordan2@prodigy.net

KAISER, KIRSTIE L., Paseo de las Conchas Chinas #115 Depto. 4, Fracc. Conchas Chinas, Puerto Vallarta, Jalisco, C.P. 48390, Mexico, 011-52 (322) 221 5041, FAX 011-52 (322) 221 5042, E-mail: klkaiser@prodigy.net.mx

KALOHL, KATHY & JOSEPH, 13901 Wilkie Ave., Gardena, CA 90249, (310) 719-1816, FAX (310) 538-3889, E-mail: wrckdiver77@yahoo.com

KANNER, PAUL H., 10609 Esther Ave., Los Angeles, CA 90064, (310) 559-7140, FAX (310) 559-9423, E-mail: pkann@comcast.net

KEMP, BRUCE & EMI, 9420D Carlton Oaks Dr., Santee, CA 92071-2527, (619) 449-7610, FAX (619) 553-6391, E-mail: bruce.kemp@navy.mil

KENNEDY, GEORGE, 8997 Moisan Way, La Mesa, CA 91941, (619) 667-1030, FAX (858) 679-9896(work), E-mail: gkennedy@bfsa-ca.com

KRONENBERG, GIJS C., Den Bult 98, NL-5616 GJ Eindhoven, the Netherlands, E-mail: ads1711249@tiscali.nl

LAGRANGE, JOHN & LINDA, 533 North Rios Ave., Solana Beach, CA 92075-1245, Phone/FAX (858) 755-7215, E-mail: john.lagrang@gmail.com

LANCE, JAMES R., 3220 S. 8<sup>th</sup> St., Lebanon, OR 97355-1069, (541) 258-3709, E-mail: jlance@dswebnet.com

LEVIN, DEBRA J., 3100 Van Buren Blvd., Apt. 1117, Riverside, CA 92503-5623, (951) 354-7002 E-mail: levindj@att.net also lvndj@netscape.net

LOVELL, LARRY, Benthic Invertebrate Collection, SIO/UCSD/Mail Stop 0244, 9500 Gilman Drive, La Jolla, CA 92093-0244, (858) 822-2818, (760) 945-1608 (home), FAX (858) 822-3310, E-mail: llovell@ucsd.edu

LUTHER, DOUG & MARY, 1535 Ipukula St., Honolulu, HI 96821-1419, (808) 377-5173, E-mail: dluther@soest.hawaii.edu

LYONS, WILLIAM G., 4227 Porpoise Dr. SE, St. Petersburg, FL 33705, E-mail: w.lyons9@knology.net

MARR, LAURETTA, 2646 Cherokee Rd. #9, Johnson City, TN 37604, (432) 926-9782, E-mail: RLMMID@aol.com

MCCLINCY, RICHARD J., 2332 W. Calle Ceja, Green Valley, AZ 85614, (520) 625-5697, E-mail: pmcclincy@att.net

MCLEAN, JAMES H., Malacology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007, (213) 763-3377, FAX (213) 746-2999, E-mail: jmclean@bcf.usc.edu

METZ, GEORGE E., 121 Wild Horse Valley Dr., Novato, CA 94947-3615, (415) 892-4960, E-mail: romageometz@comcast.net

MICHEL, JOHN & NOLA, 4758 Mt. Cervin Dr., San Diego, CA 92117, Phone/FAX (858) 278-9088, E-mail: ejmco@san.rr.com

MOGOLLÓN, VALENTÍN, Roma 340, Lima 18, Perú, E-mail: svmogollon@yahoo.com

MULLINER, DAVID K. & MARGARET, 5283 Vickie Dr., San Diego, CA 92109-1334, (858) 488-2701, E-mail: mulliner1@juno.com

MUSÉUM NATIONAL D'HISTOIRE NATURELLE, Bibliothèque BIMM, 55 Rue Buffon, 75005 Paris, France (EURO 1-334)

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NATURALIS, BIBLIOTHEEK, Postbus 9517, 2300 RA Leiden, The Netherlands

NELSON, LOIS V., 7222 N. 15th Ave., Phoenix, AZ 85021-7918, (602) 347-9667

NORRIS, CHARLOTTE, 233 E. Cairo Dr., Tempe, AZ 85282-3607, (480) 967-4957, E-mail: charnorr2@aol.com

NORTHROP, MARILYN N., 1528 Education Court, Lehigh Acres, FL 33971, (518) 383-6624, E-mail: mjohnorthrop@worldnet.att.net

PASQUA, ROBERT A., 2236 Via Chalupa, San Clemente, CA 92673-3634, (949) 492-6855, E-mail: pasqua@cox.com

PEÑA GONZÁLES, G. MARIO, Edificio Los Jazmines 206, Residencial San Felipe, Jesús María, Perú

PHILLIPS, TONY, Hyperion Treatment Plant, Environmental Monitoring Division, 12000 Vista Del Mar, Playa del Rey, CA 90293, (714) 397-0014, E-mail: CUMACEA@Yahoo.com

PIERCE, KATHY, P.O. Box 1021, Wildomar, CA 92595-1021, (951) 674-9370, E-mail: kathypierce\_realty@yahoo.com

PIERCE, ROSEMARY, P.O. Box 532, Wildomar, CA 92595-0532, (951) 609-9801

PISOR, DON & JEANNE, 10373 El Honcho Pl., San Diego, CA 92124-1219, (858) 279-9342 (home), (858) 274-4830 (warehouse), FAX (858) 274-4850, E-mail: dpisor@earthlink.net

PISTER, BENJAMIN A., University of California, San Diego, 9500 Gilman Dr., Mail Code 0116, La Jolla, CA 92093-0116, (858) 453-7369, E-mail: bpister@ucsd.edu

POWELL, CHARLES L., Western Earth Surface Processes Team, U.S. Geological Survey, M/S 975, 345 Middlefield Rd., Menlo Park, CA 94025, E-Mail: cpowell@ucgs.gov

RITTER, WILLIAM J., 1005 Exchange Apt. 13, Astoria, OR 97103-0900, (503) 325-7948, E-mail: bulwinkl@pacifier.com

ROBERTS, DALE L. & KIMBERLY, 28402 Harvest View Lane, Trabuco Canyon, CA 92679, (949) 459-8886, FAX (949) 888-2786, E-mail: dale\_roberts@allergen.com

SANTA BARBARA MUSEUM OF NATURAL HISTORY, Department of Invertebrate Zoology, 2559 Puesta del Sol Rd., Santa Barbara, CA 93105-2936, (805) 682-4711

SCHNEIDER, WILLIAM & NANCY, 12829 Carriage Rd., Poway, CA 92064-6045, Phone/FAX (858) 748-2822, E-mail: jtkcmom@sbcglobal.net and bajafisher@sbcglobal.net

SCHOENING, ROBERT C., 10607 Norman Ave., Fairfax, VA 22030-2928, (703) 273-9755, FAX (703) 352-7124, E-mail: rschoening@aol.com

SKOGLUND, CAROL, 3846 E. Highland Ave., Phoenix, AZ 85018, phone/FAX (602) 955-2072, E-mail: carolskoglund@msn.com

SMALL, MICHAEL, 12 Lambton Ave., Ottawa, Ontario K1M 0Z5, Canada, E-mail: michaelsmall@sympatico.ca

SUNDERLAND, WALTER A., 7610 NE Earlwood Road, Newberg, OR 97132-7109, (503) 625-6840, E-mail: wallens@earthlink.net

THE NATURAL HISTORY MUSEUM, Acquisitions Section, Dept. of Library & Information Services, Cromwell Rd., London SW7/5BD

South Kensington, United Kingdom, 44 (171) 938-9368, FAX 44 (171) 938-9505, E-mail: e.jamieson@nhm.ac.uk

UNDERWOOD, DORIS K., 698 Sheridan Woods Dr., West Melbourne, FL 32904, (321) 724-2449, E-mail: dunderwood1@cfl.rr.com

VALENTICH-SCOTT, PAUL, Santa Barbara Museum (NH), 2559 Puesta del Sol Rd., Santa Barbara, CA 93105, (805) 682-4711 ext. 146, FAX (805) 563-0574, E-mail: pvscott@sbnature2.org

VAWTER, DORIS, 3208 Bonita Mesa Rd., Bonita, CA 91902, (619) 479-7687, E-mail: vevawter@cox.net

VELARDE, RON, City of San Diego, EMTS Laboratory, 2392 Kincaid Rd., San Diego, CA 92101-0811, (619) 758-2331, 758-2350, E-mail: RVELARDE@SANDIEGO.GOV

VOLLERO, SILVANA & BOB PETROSKI, 5613 Carnegie St., San Diego, CA 92122, (858) 625-0756, E-mail: svollero@san.rr.com

VON KRIEGLSTEIN, DOUG, 11288-A San Juan, Loma Linda, CA 92354, (909) 825-7207, FAX (909) 796-9658, E-mail: dougvon2002@yahoo.com

WATERS, CHARLES, 2703 Hutchison St., Vista, CA 92084, (760) 941-2067

WEBER, GLADYS, 3607 Sylvan Meadows Court, Modesto, CA 95356-2011, (209) 549-1071, E-mail: gladweber@aol.com

WEBSTER, HERB & MELLA, 4403 Sierra Morena Ave., Carlsbad, CA 92008, (760) 730-3648, E-mail: mellamella@adelphia.net

WHITE, JACKIE, 886 Mountridge Ct., Las Vegas, NV 89110-2911, (702) 452-9651, FAX (702) 454-1268, E-mail: jcwshells@aol.com

WHITMAN, CHARLES H., 45 East End Ave. (10-A), New York, NY 10028, (212) 861-8211, E-mail: chwhit@nyc.rr.com

WOOLSEY, JODY, 3717 Bagley Ave. #206, Los Angeles, CA 90034-4148, (310) 839-1604, E-mail: mary.jowo@mac.com

WU, SHI-KUEI, Campus Box 265, MCOL Bldg, University of Colorado, Boulder, CO 80309-0265, Phone/FAX (303) 444-2306, E-mail: skwu@colorado.edu

WUYTS, JEAN, Koningsarendlaan 82, B-2100 Deurne, Belgium, E-mail: wuyts.jean@scarlet.be

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## MEMBERSHIP AND SUBSCRIPTION

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Address all correspondence to the San Diego Shell Club, Inc.,  
 c/o 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA.

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 Room 104, Casa Del Prado, Balboa Park, San Diego

Website at: <http://www.sandiegoshellclub@terryarnold.net>  
 E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### New Insight for West Coast Chitons

Dr. Doug Eernisse of California State University, Fullerton, latest discoveries in the Polyplacophoridae highlighting his  
 will give a PowerPoint presentation on the talk with beautiful images.

Meeting date: March 16, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting February 16, 2006

The meeting was called to order at 7:50 PM by President Bill Schneider. The minutes of the meeting were approved as published in *The Festivus*.

Librarian Marilyn Goldammer announced new book arrivals in the library, a gift of member Bruce Kemp. Botanical Society Representative Wes Farmer reminded those gathered that users of the room were to act as their own janitors. Further, Wes suggested that the Club's URL be posted on the sign outside the door, for use by passers-by. Marilyn reminded all of the upcoming Annual April Auction to be held in the Community Room at Wes Farmer's condo. Wes commented that he has hosted the event for the past 17 years and is desirous of continuing this activity which so benefits *The Festivus*.

The evening's speaker, Ángel Valdés, of the Los Angeles County Museum of Natural History, was introduced by Larry Lovell, substituting for Vice-President John LaGrange, who is at sea. It was illuminating to learn that there were 3,000 identified species of shelled opisthobranchs, mostly marine. Evolutionary trends concerning the reduced or lost shell were traced using a PowerPoint presentation. Although the larval shell may remain, most opisthobranchs have developed alternative defense mechanisms including 1) stinging cells (in nudibranchs) and 2) chemical defenses. DNA analysis has revolutionized the way to look at the phylogenetic systematics of opisthobranchs and reclassification is taking place. Noteworthy to the morphologist is the observation that the protoconch twists to the left, while mature whorls go to the right, similar to other gastropods. Species vary by anatomy, radula, and gizzard plate. Valdés and James McLean are preparing a paper on local opisthobranchs, to be published soon.

The shell drawing, a "ghost shell" was won by Wes Farmer. The meeting was adjourned at 8:40 PM. Coffee was appreciated on this cold evening, with cookies provided by the Schneiders.

### What an Auction this will be!!

On Saturday evening, April 8<sup>th</sup> beginning at 5 PM at the Clubhouse of Wes Farmer's condo, you'll be hearing the oohs and aahs for miles around. What a special auction this will be – The Billee/Twila Auction/Potluck!!.

Besides the rare and uncommon volutes, cowries, cones, haliotids and murex; there will be some unusual related items such as ironwood carvings, a set of Bert Draper's Minute California Mollusk species, long unavailable, an inscribed copy of Keen(1971) [well annotated], a *Review of the Triviidae* by Crawford Cate, an assortment of miniature cowries, a Galapagan assortment (13 species), colorful corals, a large octopus pottery plate and a land snail set (21 species with data) among others.

The Silent Auction will be overflowing with bargains this year and the Dollar Table will be like combing the beaches for goodies.

Sooooooooo save the date and come to the Auction/Potluck. We'll look forward to seeing you there. [See map to auction included with this issue.]

### The Festivus has a new supplement: *Comprehensive Index to The Festivus 1970-2005*

*The Festivus* has now published another supplement which is an index from 1970, its first issue, through 2005. The 44-page index "is a compilation of the papers and articles as well as supplements and occasional papers which have appeared monthly ..." since the publication's inception in 1970. The index is arranged both by author and by key words.

This supplement is now available to interested parties for \$ 10.00 postpaid domestic; \$12 (Mexico & Canada) postpaid airmail and \$15.00 postpaid overseas airmail.

If you are interested in receiving the index, contact editor Carole Hertz <cmhertz@pacbell.net> or write to her at the Club address on the front page.

### Too Late for the Roster

Kosuge, Sadao, 6-36 Midoricho 3chome, Nishi-todayo City 188-0002 Japan. Tel. & Fax: 0424-63-0851; Overseas (+81)-424-03-0851. E-mail: I.M.T.KOSUGE@excite.co.jp  
Peña, Mario, <gregoriomariop@yahoo.es> new e-mail.

COLLECTING *RHIZOCHILUS ANTIPATHUM* BY HOOK & LINE

BILL SCHNEIDER

12829 Carriage Road, Poway, California 92064-6045, USA

E-mail: bajafisher@sbcglobal.net

In December 2004, I participated in a yellow-fin tuna fishing trip to the Hurricane Bank, a popular sport fishing destination. It encircles a seamount 1000 miles south of San Diego and 600 miles west of mainland México. But fish was not all that was caught! We were bottom fishing for grouper at one stop but we were in for a surprise. Entangled in the line of one of my fellow fishermen was a large black bush. He brought it to the surface from deep water--the depth finder registered 128 meters (420 ft). I recognized it as being the largest specimen of black coral that I had ever seen, almost seven feet tall. Because I was familiar with the lapidary qualities of black coral, and because I was intrigued with the strange mollusks clinging to it, and just because I was curious, I told the fisherman that I would like to have the coral. Nobody else could understand why I would want that bush all snarled up in fishing line. But I was determined to find out more about it upon my return home.

Not long afterward, the online journal *Zootaxa* published a paper by Dennis M. Opresko that described a new species of antipatharian (black) coral from the southern California Bight. Might our specimen be this one? Negative. Microscopically the spines on this specimen did not match up with those of the newly described species. So I e-mailed Dr. Opresko and he agreed to look at the newly "caught" coral. Subsequently a sample was sent to him and it was identified as *Myriopathes ulex*, with the observation that this species was known from Hawaii and several other localities (Figure 1).

The order Antipatharia of the class Anthozoa includes four families: Antipathidae, Leiopathidae, Schizopathidae, and Myriopathidae. Eight genera include an estimated 150 species. Black corals are found worldwide, but most commonly in the Indo-Pacific and Caribbean regions. Antipatharians are usually found between 30 and 80 meters, but have been found to a depth of 6000 meters. They tend to live in low light conditions, either in deep water or in shaded areas of

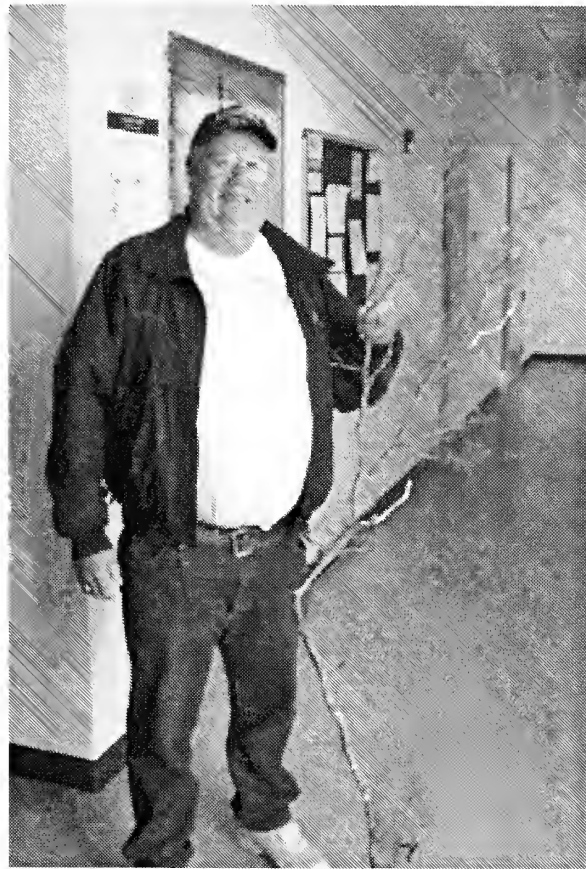


Figure 1. Bill Schneider with black coral "tree" *Myriopathes ulex* brought up off Hurricane Bank in 128 meters. Published courtesy of the SCAMIT Newsletter.

shallow water. They are frequently found in strong currents. All black corals are colonial with a rigid skeleton composed of protein. The skeleton does not contain calcium and there are no calcareous spines. The polyps are small and have six tentacles. Tiny spines from .04 to .6 mm cover the skeleton. The size, shape, and density of these spines are used in identification (ARKive.org).



In 2001 Opresko revised the Antipatharia and established the new family, Myriopathidae, assigning to it *Antipathes ulex* Ellis & Solander, 1786. He has been working on revising the classification of the antipatharians since 1972, in 28 publications ([hercules.kgs.ku.edu/hexacoral](http://hercules.kgs.ku.edu/hexacoral)). In his words:

"*Antipathes*" *ulex* was first described in 1786 by Ellis and Solander, but because there is no type and the original description was limited, the definition of the species has changed over time, and the interpretation given by Brook (1889, Challenger Report) has usually been followed. Your specimen does fall within Brook's general definition. However, what needs to be done to clearly fix the morphological limits of the species is the establishment of a neotype, and that is something I need to do sometime in the future. There may actually be several closely related species which are now grouped within *ulex*.

More and more work is being done on molecular analysis (DNA sequencing) of corals to differentiate closely related species and this type of analysis may also be needed in this case. As far as the distribution of the species is concerned, it has been reported from many localities in the Indo Pacific. Brook has it listed as occurring in the East Indies, Philippines, and Indian Ocean; however, it is not known how accurate these records are. I have identified material from Indonesia and Hawaii as *ulex*, and the records of the USNM may contain additional localities.

In January 2005, the bushy black coral, over six feet high, was shown at the Annual Meeting of the Southern California Unified Malacologists (SCUM). Of malacological interest were the mollusks clinging to the base of the coral. The white, flaring, irregular apertures of this molluscan species appeared to be embedded in the tissue of the host coral. John Ljubenkov, a cnidarian specialist, confirmed that the coral was indeed an antipatharian and that the deep-water mollusk, *Rhizochilus antipathum* Steenstrup, 1850, was attached to its holdfast. He further stated that *Rhizochilus antipathum* occurs only in deep water on antipatharian corals (Figure 2).

Kaiser and Hertz (2001) have reviewed the occurrence of *Rhizochilus antipathum* in the eastern Pacific in their excellent report in *The Festivus*. Gray (1851: 477), intrigued with Steenstrup's cryptic specimens observed:

...that the shell of this genus while the animal is growing is free,...but when the animals have arrived at their full development, two or more congregate together in groups, each animal forming a more or less irregular, opaque, white, solid shell extension of



Figure 2. Group of *Rhizochilus antipathum* on the base of *Myriopathes ulex*. Published courtesy of the SCAMIT Newsletter.

the outer and inner lip, clasping the axis of the coral or the neighbouring shells, or both, and at length entirely closing the mouth of the shell... the animal is completely surrounded by a solid shell case having no communication with the outer world but through the case of the anterior siphon, which ... has been converted into a shelly tube ... the supply of water for respiration which can enter by the single siphon must be of a very limited quantity, there being only one aperture for its entrance and exit, in comparison with the continued current which usually circulates over the gills when the two apertures (one for entrance and the other for exit), which always exist in all Mollusca, are open for the purpose. This self-immurement of the animal within its shell has not been described in any other mollusk."

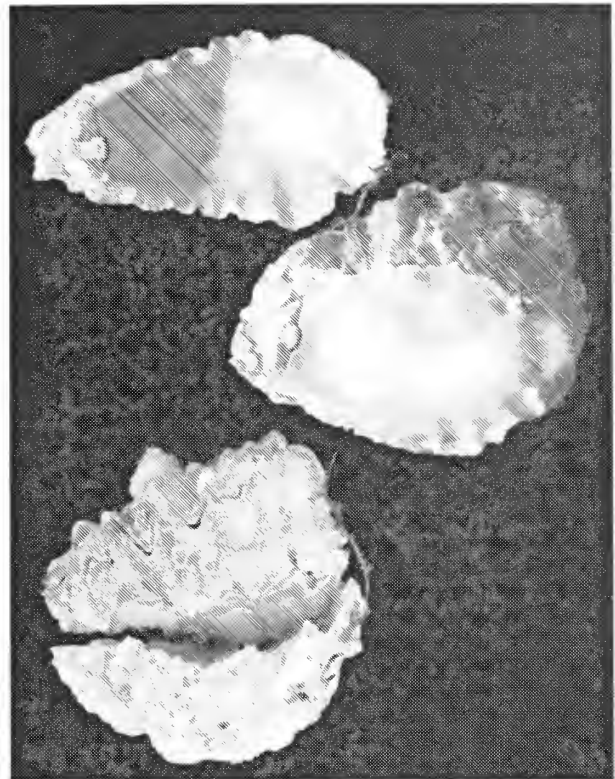
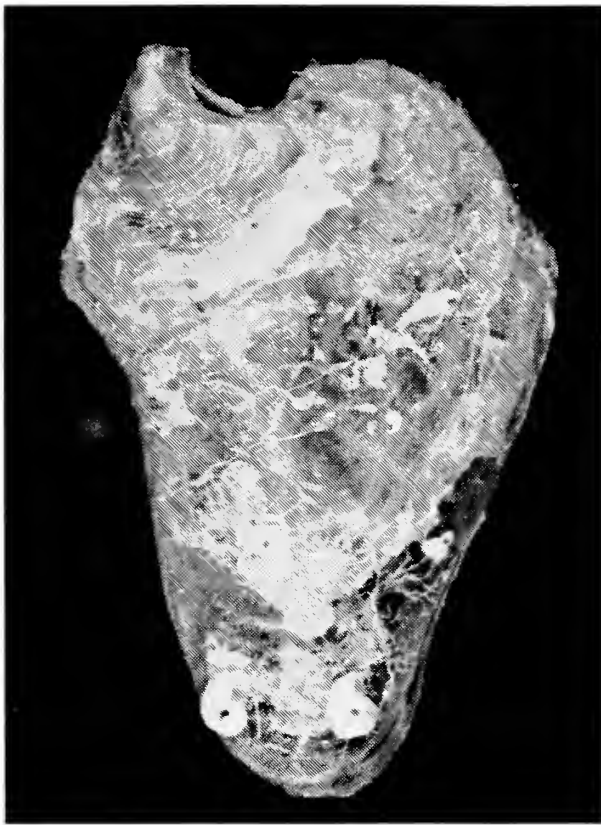
### Associated species

A fist-sized anthozoan (hard coral) colony was found entangled in the line that snagged the black coral. It has been tentatively identified by Ljubenkov as *Caryophyllia* sp. (*californica* or *pedroensis*) and is a Pleistocene species (Cairns, 1994).

Other living marine species collected with the black coral, include the following molluscan species:

1) *Malleus rufipunctatus* (Reeve, 1858) (Figure 3) was not attached to *Myriopathes ulex*. It was found attached and within a ?hydroid colony at the base of the gorgonian *Pacifigorgia gracilis*. Distribution includes Isla Clarión, Islas Revillagigedo, México.

2) *Myrakeena* cf. *angelica* (Rochebrune, 1895), identified tentatively by Eugene Coan and Paul Valentich-Scott, found attached to *M. ulex* (Figure 4),



Figures 3 and 4. (3) *Malleus rufipunctatus* (13.6 mm L) found attached to the ?hydroid at the base of the gorgonian *Pacifigorgia gracilis*. (4) *Myrakeena* cf. *angelica* (42 mm L) attached to *Myriopathes ulex* when brought up. Photos: Patricia Sadeghian.

ranges from San Felipe, Baja California to Rocas Alijos, México.

3) *Petalococonchus* cf. *macrophragma* Carpenter, 1857 (Figure 5), attached to valve of *Myrakeena* cf. *angelica*, ranges from Baja California, México to Panamá.

4) *Chama* cf. *arcana* F.R. Bernard, 1976 (Figures 6, 7), several intact Pleistocene specimens were on the *Caryophyllia*. Distribution of Recent specimens from Pacific Grove, California to Bahía Magdalena, Baja California Sur and the Golfo de California, México.

5) *Coenocyathus bowersi* Vaughn, 1906 (Figures 8, 9), an anthozoan tangled in line, a colonial coral with cylindrical corallites, is reported from Golfo de California and Golfo de Panamá; Colonet, Baja California, México to Monterey Bay, California.

6) *Pacifigorgia gracilis* with ?hydroid attached at base (Figure 10), was brought up with the black coral.

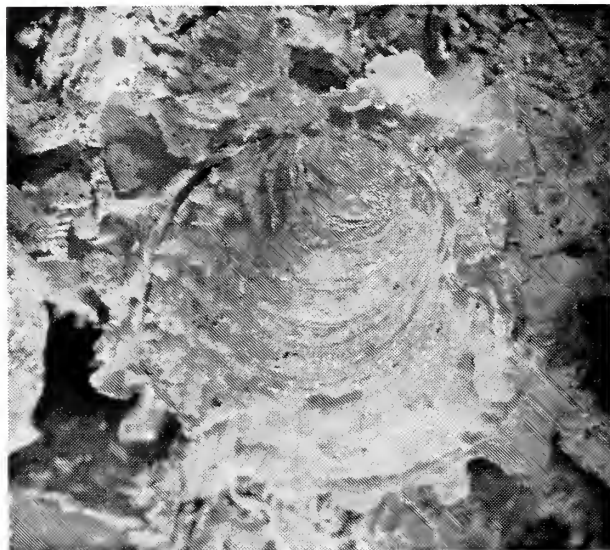
7) *Oxynapsis* sp. Darwin, 1852). "This represents a potentially new species of crustacean, the second of

the genus *Oxynapsis*, for the entire Eastern Pacific! Five specimens were attached to the branches of this *Myriopathes* cf. *ulex*. At this time a revision of *Oxynapsis* is being worked on, including new forms from the Indo-West Pacific, one from the Gulf of California and another from the Galapagos Islands. But more work will have to be done to be sure since how the host influences the form of such barnacles is not known." (pers. comm., William A. Newman).

### Conclusion

*Rhizochilus antipathum* is the rarest shell I have ever found. I could not bring myself to cut the coral for the sake of adding this rare shell to my collection. As a result, the black coral bush and the strange shells and other invertebrates it harbors have now found a new home in the Benthic Invertebrate Collection at the Scripps Institution of Oceanography. These specimens will add to the record of the ocean environment for





Figures 5 and 6. (5) *Petalocochus* cf. *macrophragma* ( $\pm 21$  mm L) attached to valve of *Myrakeena* cf. *angelica*. (6) *Chama* cf. *arcana* ( $\pm 15$  mm L) one of several Pleistocene specimens found on the clump of *Caryophyllia* (120 mm L): Photos: Kelvin Barwick.

research purposes at this prestigious center of learning. I am left with a picture on my wall and the memory of this event. So next time you come to San Diego, go to

La Jolla to view my fabulous colony of *Rhizochilus* on display. There is always another year of tuna fishing at the Hurricane Bank.

### Acknowledgments

I wish to thank Eric Hochberg, Beth Horvath, John Ljubenkov, Dennis Opresko, Daniel Geiger, Larry Lovell and William Newman for taxonomic assistance with these specimens; Kelvin Barwick, Daniel Geiger and Patricia Sadeghian for the excellent photography; Nancy Schneider for typing the manuscript and Carole and Jules Hertz for continued helpful assistance.

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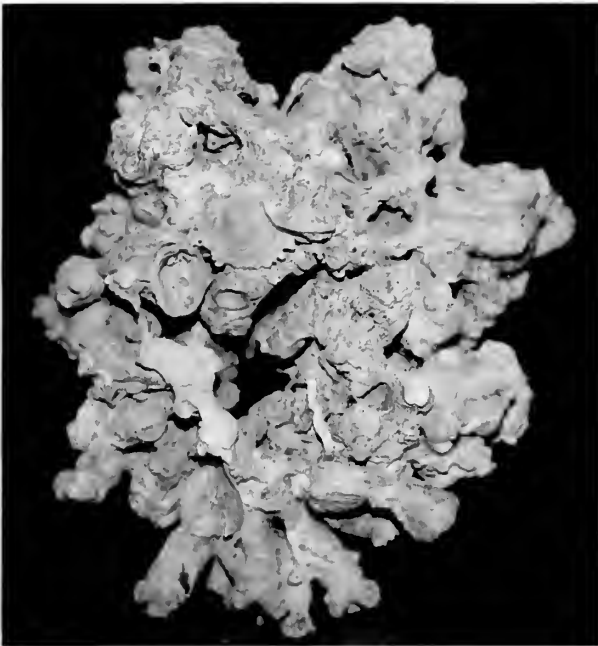


Figure 7. Clump of *Caryophyllia* with specimens of *Chama* cf. *arcana*. Photo: Kelvin Barwick.



Figures 9 and 10. (9 above) SEM of individual polyp of the coral shown in Figure 8. Photo: Daniel Geiger. (10 right) *Pacifigorgia gracilis* ( $\pm 170$  mm L) with hydroid attached to base, brought up with the black coral. Photo: Patricia Sadeghian.

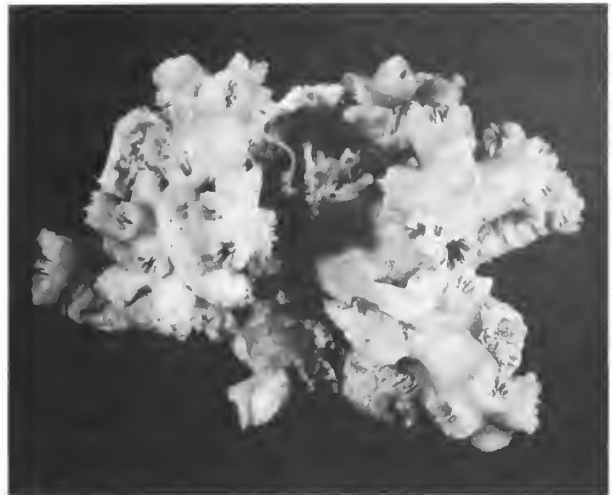
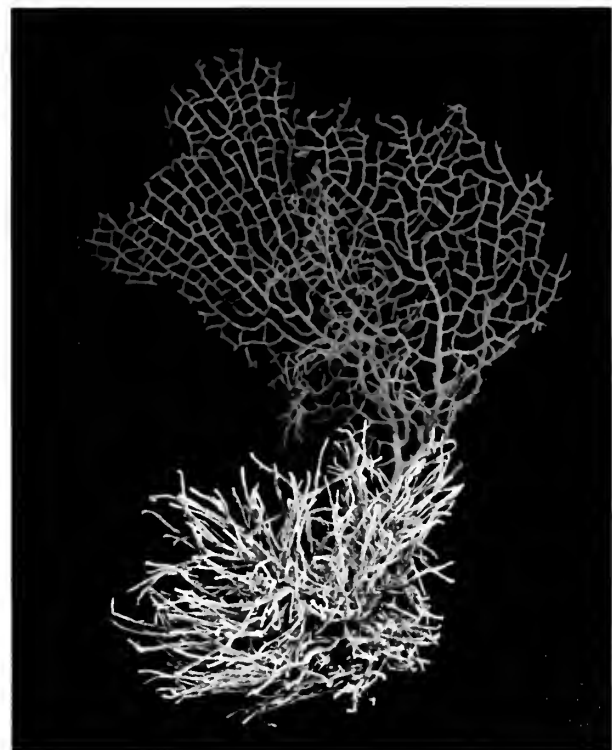


Figure 8. *Coenocyathus bowersi* (46 mm), an anthozoan tangled in the line. Photo: Patricia Sadeghian.





## THE TENTH ANNUAL SCUM MEETING

The tenth annual meeting of the Southern California Unified Malacologists (SCUM) was held on 21 January 2006 at the Santa Barbara Museum of Natural History. (SBMNH). Refreshments were available at 9:00 a.m. and the meeting was officially convened at 10:00 a.m. There were 41 attendees (Figure 1), by far the largest attendance ever.

Daniel Geiger hosted the meeting and opened it by welcoming everyone. There was a round of self introductions with a brief statement from each of the attendees on their interests and accomplishments for the previous year. This was followed by a series of short PowerPoint presentations. Daniel Geiger, the first presenter, talked briefly about the newly acquired electron microscope at the SBMNH, his work on

histology and a new sampling approach using a very small, easily transportable grab sampler. He discussed his work on Indo-Malayan and Red Sea scissurellids, as well as Australian, Panamic, South African and Caribbean species of *Sinezona* and *Anatoma* and also showed photographs of *Ariella*, scissurellids that have no selenizone.

Wes Farmer, the next presenter, gave a picture story of fishing for Humboldt Squid (*Dosidicus gigus*) off 9-Mile Bank using green lures (glow rigs). The animals caught were approximately 4-feet long. Wes presented data on daily catches and had a humorous story of how the ship's captain left a non-productive spot and went around the bank for about an hour to stop in supposedly a better spot but which actually was (by



Figure 1. Group photo of attendees at the 2006 SCUM meeting. Photo: Wes Farmer. Caption: Lindsey Groves

**Front Row (seated):** Shawn Wiedrick, Doug Eernisse.

**Second Row:** Bob Sinclair, Scott Rugh, Carole Hertz, Jules Hertz, LouElla Saul, Tony Phillips.

**Third Row:** Bob Stanton, Phil Liff-Grieff, Paul DeFlorio, Paul Valentich-Scott, Daniel Geiger, William Hewson, Albert Rodriguez, Alvin Alejandrino, Christina Fernandez, Mike Vendrasco.

**Fourth Row:** John Ljubenkov, Lance Gilbertson, Henry Chaney, Jim McLean, James Weaver, Kent Trego, Brandon Lincicum, Lindsey Groves, Curtis Cash, Chuck Powell II, George Kennedy, John Alderson.

**Not in photo:** Don Cadien, Wes Farmer, Lauren Forest, Jeff Goddard, Eric Hochberg, Jay Shrake, Carla Stout, Ángel Valdés, Ron Velarde.

Wes's GPS) the exact location they had fished before.

Kent Trego, the next presenter, talked about abyssal holothurians seen at Station M, an area 200 miles west of Pt. Conception. This is a site that has been studied for 16 years by researchers from Scripps Institution of Oceanography. He discussed 24 species of abyssal plain animals.

Paul Valentich-Scott gave a presentation on the book that he and Eugene Coan are preparing on *Bivalves of Tropical West America*. This will be a companion book to *Bivalve Seashells of Western North America* that they authored in 2000. The new book will use a similar format and will include species from all the offshore islands. It will cover approximately 850 species, about 30 of them new and approximately 20 of them introduced species. All photographs will be in color except for SEMs. It will include keys and large illustrated tables.

The most interesting of the presentations, to me, was made by Don Cadien, entitled *Aplacophore Mollusks of the 2003 Regional Monitoring Survey of the Southern California Bight*. The presentation was based on a report that he and Kelvin Barwick did that was published as SCAMIT Supplement Volume 23. It covered 18 different taxa based on differences in radulae and scales with beautiful colored illustrations by Kelvin.

Scott Rugh gave a talk entitled Imperial Group Fossils and Their Modern Relatives. He compared similar species in the Caribbean and Panamic regions, a discussion of cognate species which has been known for many years.

Phil Liff-Grieff gave a very interesting presentation on collecting land snails on his trips to Israel, Poland and Jordan. In Poland he collected in a cemetery in Warsaw, in Jordan at a truck stop, and in Israel he searched for desert land snails particularly *Xerocrassa davidiana picardi* which is approaching extinction. Most of Israel is composed of limestone and the snails, both species and subspecies, live on calcified sandstone. Phil stated that a good place to look for snails are in ant hills. Phil and a friend found only one colony left of *X. d. picardi* in an area scheduled for destruction and they spent a goodly amount of time busily moving a portion of the colony to a safe area.

The next series of presentations were by Doug Eernisse and two of his students, William Heweson and Albert Rodrigues. Doug spoke of 25 species of chitons restricted to the northern Pacific. He stated that the Mopaliidae are being revised with sister taxa. He illustrated the diverse setae of these taxa and discussed sequencing data. He stated that there is clear molecular support for what collectors have distinguished as separate species. Doug is also looking at sea stars, i.e. seven new species of *Henricia*. William Heweson described his project, Phylogeography of two northeastern Pacific limpets: *Lottia paradigitalis* and *Lottia strigatella*. Carpenter originally noted differences between northern and southern specimens of *strigatella*. Northern specimens were called *paradigitalis* with the break point of the distribution occurring at Pt. Conception. Albert Rodrigues' undergraduate project deals with six species of chitons and six species of limpets. The project asks the question: Is Palos Verdes Peninsula a genetic barrier for chitons and limpets? Data to date reject the hypothesis.

At this point the meeting adjourned for lunch provided by the SBMNH. Lunch consisted of a variety of sandwiches, a huge salad, and a choice of soft drinks. During the lunch period, attendees could visit a new exhibit in the museum consisting of beautiful enlargements of scanning electron micrographs taken with the new microscope. The group photograph was taken at the conclusion of the lunch break and this was followed by a return to brief presentations by other attendees.

Jim McLean gave a status report on his main project, a book on the gastropods from Kamchatka to northern Baja California. He has made significant progress and he now says that completion is now less than three years away. He has also completed his chapter for *Light's Manual* and noted that the west coast trochids in the genus *Tegula* have been changed to the genus *Chlorostoma*.

At the end of the meeting, Scott Rugh volunteered to host next year's SCUM meeting in January 2007 at the San Diego Natural History Museum. The meeting was adjourned and attendees were invited to tour the invertebrate collection and laboratory at the SBMNH.

Jules Hertz



## BOOK NEWS

### Eastern Pacific Nudibranchs: A Guide to the Opisthobranchs from Alaska to Central America

By: Behrens, David W. and Alicia Hermosillo. 2005

Publisher: Sea Challengers, Monterey, CA. ISBN 0-930118-36-7

vi + 137 pp., 324 color pls., softbound

Price: \$35.00

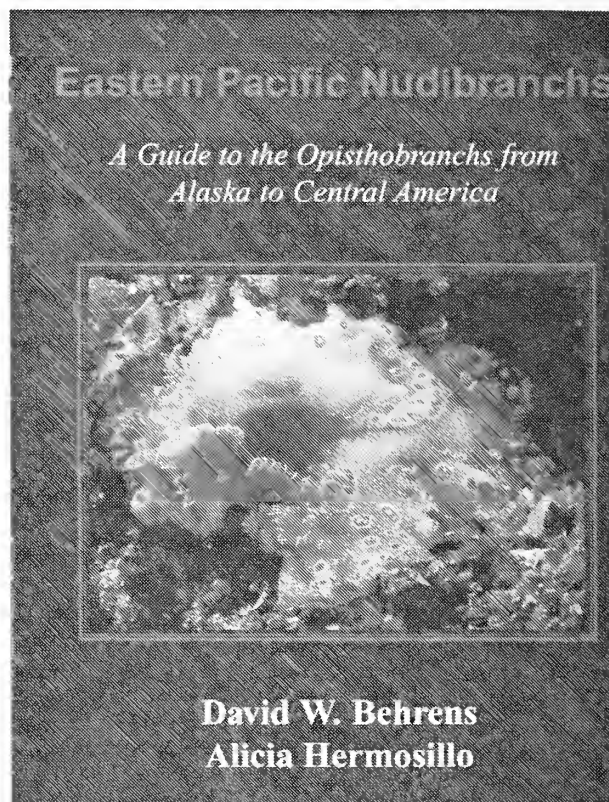
Everyone loves nudibranchs. Or so it seems to those of us who dive, snorkel, tidepool, surf the web, or are concerned about oceans' biodiversity. Truly beautiful, biologically intriguing, they deserve to be treated beautifully and intelligently. Dave Behrens and Ali Hermosillo totally fulfill this demanding task for excellence in their new book, *Eastern Pacific Nudibranchs: A Guide to the Opisthobranchs from Alaska to Central America*.

#### A Sense of History: Context and Comparisons

This book is actually the 3<sup>rd</sup> edition in a series: *Pacific Coast Nudibranchs: A Guide to the Opisthobranchs of the Northeastern Pacific* (Behrens, 1980; Sea Challengers, Los Osos, CA. 112 pp.) and *Pacific Coast Nudibranchs: A Guide to the Opisthobranchs, Alaska to Baja California*, 2<sup>nd</sup> edition (Behrens, 1991; Sea Challengers, Monterey, CA. vi + 107 pp.). Each of the editions demonstrates the current state of our knowledge regarding the cold, temperate and tropical waters of the northeast Pacific. Both the 1<sup>st</sup> and 2<sup>nd</sup> editions covered the area from Alaska to the tip of the Baja California peninsula; this 2005 volume covers most opisthobranchs occurring from Alaska to Central America. These works also show the research progress in and our increased understanding of the opisthobranch biota in these NE Pacific faunal zones.

In the first edition, 162 species were listed, including 14 unnamed species; the 2<sup>nd</sup> edition presented 217 species, with 27 unnamed species, and species names were assigned to 13 of the 14 previously unidentified species.

Behrens and Hermosillo now report 314 opisthobranch species as occurring in the area covered, with 37 of them unnamed. Over ¾ of these undescribed species (29 out of 37) are reported from the additional southern region covered in this book. Obviously, this demonstrates both the paucity of our knowledge of the southern Pacific Mexican coast opisthobranch fauna and the recent long-term in-depth studies being conducted by



Ali Hermosillo and colleagues. Of the 27 unnamed species in Behrens, 1991, 16 appear with correct binomials in the 3<sup>rd</sup> edition.<sup>1</sup>

<sup>1</sup>Five of these now described species are not given references to their sp. (undescribed) status in the 2<sup>nd</sup> edition: *Elysia cornigera* (species # 37 in Behrens, 1991), *Akiodoris salacia* (# 68), *Triopha catalinae* (# 85), *Dendrodoris azinae* (# 131), and *Flabellina amabilis* (# 174).

Four unnamed (sp.) animals from the 2<sup>nd</sup> edition were dropped from coverage in this 3<sup>rd</sup> edition because of their rarity, never having been seen again: *Placida* sp. 1 (# 40 of Behrens, 1991), *Taringa* sp. 1 (# 121), the distinctive, Undescribed dorid no. 1 (# 125), and *Doto* sp. 1 (# 153).

Two named species from the region of coverage are not included in Behrens & Hermosillo: the extremely rare *Aglaja regiscorona* Bertsch, 1972, and the deep-water (~3000 m) *Bathydoris aioca* Ev. Marcus & Er. Marcus, 1962.

The prefaces to the three editions end with passionate clarion calls for knowledge, conservation and appreciation of nudibranchs and all life forms with which we share this Blue Planet. Each preface provides historical contexts to opisthobranch research along the Pacific coasts of Canada, the U.S. and México. Bertsch (1980) divides these study efforts into precise time spans, based on individuals. Terrence Gosliner (1991 and 2005) updates the recent increases of knowledge about opisthobranch biodiversity and biogeography, anatomy, phylogeny and natural history. It can properly be said that the period 1980–2005 represents the sixth era following my original designations. This explosion in understanding is due in no small measure to Dave Behrens' incredibly excellent and challenging prior editions of *Pacific Coast Nudibranchs*.

### Into the 21<sup>st</sup> Century

Probably no other major taxon of marine organisms in the NE Pacific has been studied as greatly as the opisthobranchs. This is evidenced not just in descriptions of new species, but also in the multitude of field and laboratory studies. This book is the “go-to” source for a summary of, and introduction to, our current knowledge.

Dave Behrens (now joined by Ali Hermosillo) continues to set new and higher standards for precise, comprehensive, informative and perfectly illustrated field guides to faunal regions. Following a synecdochic tradition of other field guides (e.g., *Hawaiian Nudibranchs* by Bertsch & Johnson and *Nudibranchs of Southern Africa* by Gosliner), this book's title is *Eastern Pacific Nudibranchs*, but the taxonomic coverage extends to members of the more-inclusive opisthobranch taxon. Sea slugs, or even *babosas del mar* (in Spanish), doesn't quite reflect the audacious evolutionary responses and beauty of these “butterflies of the sea.” Besides, everybody knows nudibranchs—it is a fine word!

This is, understatedly, a fine book, tersely and brilliantly written. It must be used. More prosaically, it is an essential part of the scholarly repertoire for all interested in and concerned about nudibranchs, all mollusks, and marine faunal biodiversity—in short, all known and unknown biota.

Nudibranchs provide a microcosm of evolution, the guiding law of biology. For example, they have been used in neuro-physiology, biochemistry and pharmacology, adaptive radiation, cladistics, vicariance and dispersal biogeography, introduced non-native species, functional morphology, and protective, warning and mimetic coloration and shapes.

This book can be divided into two major sections:

introductory information and species descriptions.

### Introductory Information:

This section summarizes major features of opisthobranch form and function: a) body form and coloration, reduction of the shell; economic or commercial uses such as medical research (nerve functioning and active antibiotic or chemotherapeutic compounds), underwater diving and photography, and sustenance by indigenous peoples; b) feeding and the radula, correlating tooth structure taxonomically and with generalized prey preferences; c) sensory organs and the rhinophores; d) respiration (both the cerata and the gill), and the defensive uses of the cerata which store nematocysts obtained from prey cnidarians, and autotomize; e) opisthobranch reproduction—mutual cross-fertilization by copulating hermaphrodites, spawn, and egg development which can be incomplete (free-swimming planktotrophic or lecithotrophic veliger larvae) or complete (fully-developed juveniles hatch from the eggs); f) collection (with emphases on ecological searching on prey items and habitat conservation by carefully replacing rolled rocks to their original positions), preservation, and identification; g) biogeography and NE Pacific faunal provinces, incorporating my ideas on the provincial level transition (“ecotonal”) zone along the southern Pacific coast of the Baja California peninsula; and, h) nomenclatural rules and systematics.

The authors present detailed instructions on how to use this book. They give tips for identification based on external characteristics of shape and color, and the use of the radula for more accurate confirmation of the species' identity. Especially useful, and superbly illustrated with Dave Behrens' exquisite black and white line drawings, are the pictorial glossary and the pictorial key to the orders and suborders of Opisthobranchia.

### Species Descriptions:

The heart of the book (fully almost 90%) is the 314 species descriptions. Each species is illustrated by at least one foudroyant color photograph. Multiple pictures show significant color variations within that species. Some are portrait-style “tub shots,” but even more overwhelming are the in situ photographs with their egg mass (e.g., *Mexichromis porterae*, *Roboastra tigris*, and *Anteaolidiella indica*) or on their prey item (e.g., *Corambe steinbergae*, *Onchidoris bilamellata*, and *Lomanotus vermiformis*).

Each species has a clear, precise, accurate, “cookie-cutter” text. Genus, species, author and year, and a vernacular “common” name are followed by five features: identification (body shape and color), radula



(rows and teeth formula given when present or if known), natural history (often food preference, but sometimes depth range, activity time, or chemical secretions), size (in mm, the worldwide standard), range, and etymology. The word origins are especially fascinating, including both the obvious (*Platydoris macfarlandi*) and the obtuse (*Glossodoris sedna*).

A bibliography providing an excellent entry into the relevant literature and a family and binomial taxa index conclude this outstanding book.

Behrens & Hermosillo, 2005, is a full book. There is not a wasted word nor illustration. It is scientifically accurate, and artistically beautiful!

This book can (and should) be ordered from Sea Challengers Natural History Books: [www.seachallengers.com](http://www.seachallengers.com)

Hans Bertsch

Research Associate, California Academy of Sciences  
192 Imperial Beach Blvd., # A, Imperial Beach, CA 91932.  
E-mail: [hansmarvida@sbcbglobal.net](mailto:hansmarvida@sbcbglobal.net)

## AMS/WSM COMBINED ANNUAL MEETING

[72<sup>nd</sup> ANNUAL AMERICAN MALACOLOGICAL SOCIETY MEETING  
39<sup>TH</sup> ANNUAL WESTERN SOCIETY OF MALACOLOGISTS MEETING]

Submitted by co-president DR. ROLAND C. ANDERSON

E-mail: [rolandanderson@ci.seattle.wa.us](mailto:rolandanderson@ci.seattle.wa.us)

I am very pleased to announce that the joint meeting of the AMS and the WSM will be held together at the University of Washington in Seattle. The meeting will begin with Council meetings during the afternoon of 29 July 2006 followed by the reception at the Burke Museum on the campus that evening. The meeting will end with field trips on 3 August 2006. This is the time of year that we have the least chance of rain in Seattle and daytime temperatures may range from 20-30°C. Evenings usually cool down below 15°C so a light jacket is recommended.

The meeting will include the usual spirited auction and four symposia/workshops, one on cephalopod behavior, one on chitons, one on opisthobranchs and one on non-marine mollusks.

**AMS Symposium: "Cephalopods: a behavioral perspective."** Organized by Jennifer A. Mather, University of Lethbridge ([mather@uleth.ca](mailto:mather@uleth.ca)). Behavior is a neglected area in molluscan research, but one with both links to other areas of study and a challenging area in its own right. Behavior is especially central for the cephalopods, with their learning capacity, individual differences and variety of sensory abilities. This symposium will tap many different aspects of behavior, from learning to personality, from sensory function to social organization and opportunistic foraging. Listeners should come to appreciate the broad range of this approach and hopefully take away new ideas on techniques to use and questions to ask in their own research.

**WSM/AMS Symposium: "Advances in Chiton Research."** Organized by Doug Eernisse ([deernisse@fullerton.edu](mailto:deernisse@fullerton.edu)). Current plans for the symposium include the following: 1) A morning session devoted to presentations by invited speakers; 2) An afternoon session with contributed papers related to any aspect of research on chitons; 3) A special section of a poster session devoted to chitons; 4) A dinner following the symposium open to anyone with an interest in chitons. Please email or call me with other ideas you might have. There is a possibility that the contributions to our symposium will be published together in a single issue of the *American Malacological Bulletin*, similar to the volume that was published in association with the 1987 AMU symposium organized by Bob Bullock on the "Biology of the Polyplacophora" in Key West, Florida [*Amer. Malacol. Bull.* 6(1), 1988]. This possibility is still being negotiated and I welcome your comments.

**Contributed Workshop: Opisthobranchs: Comprehending Diversity.** Organized by Sandra Millen ([millen@zoology.ubc.ca](mailto:millen@zoology.ubc.ca)). Much has changed in the last decade regarding our understanding of these eye-catching mollusks. They have become a favorite subject for underwater photography and in response to the continuous demand for identification; numerous web sites and books have sprung up to assist diving photographers. This in turn has increased our awareness of species ranges and unidentified species as well as adding to our knowledge of behavioral observations,

food and spawning. Researchers are frantically trying to keep up the description of new species while at the same time applying molecular and cladistic tools to more rigorously assess relationships.

**Contributed Workshop: New Frontiers in Western US Non-marine Malacology.** Organized by Terrence Frest  
Auction and reprint sale.

**For further information and registration,** contact co-president Roland Anderson, The Seattle Aquarium  
1483 Alaskan Way, Seattle, WA 98101 USA. Phone 206-386-4346. Email: [roland.Anderson@seattle.gov](mailto:roland.Anderson@seattle.gov)

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# THE FESTIVUS

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**PROGRAM**

There is no regular meeting this month.

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting March 16, 2006

The meeting was called to order at 7:45 PM by President Bill Schneider. The minutes of the previous meeting were approved as published in *The Festivus*.

Vice President John LaGrange announced that the May program will be brought to us by Tom Démeré, curator of Paleontology at the San Diego Natural History Museum. He will speak on fossil shells of the Imperial Desert.

Librarian Marilyn Goldammer encouraged the membership to use the Club's excellent library. Books may be checked out at the meetings and returned the next month. Current journals were laid out on the back table.

There was a reminder that the Annual Shell Auction/Potluck will take the place of next month's meeting. The quality of this year's items is "fantastic" and a listing of voice auction shells and books is available now. Preceding the auction there is always a potluck meal which is great fun. Auctioneer Carole Hertz encouraged members to come, enjoy and buy!

Vice President John LaGrange then introduced the evening's speaker, Doug Eernisse of California State University, Fullerton. Doug presented his work from the past two years on the subject of Polyplacophora. A PowerPoint presentation, entitled "New Insight for West Coast Chitons," revealed the speaker's enthusiasm for the subject. He pointed out that chitons date back to the Cambrian period as fossils, and even earlier as trace fossils. Chitons have sensory organs on their skin, a characteristic shared by no other mollusk and have multiple eyes. Biomineralization is present in chitons: their teeth being hardened with the iron mineral, magnetite. Studies of phylogeny and genetic sequencing were presented in graphic form. And we were shown many beautiful images of some very handsome chitons in this very informative program.

The Door Prize was won by Silvana Vollero. Adjournment came at 8:45 PM. The coffee table was

crowded with people enjoying Silvana's baby cream puffs and VP LaGrange's homemade macadamia nut chocolate chip cookies.

Nancy Schneider, Recording Secretary

### Too Late for the Roster

BEDELL, HARRY, 23852 Pacific Coast Hwy. #178, Malibu, CA 90265, (310) 456-0012. E-mail: malibuone@aol.com

NEGUS, RICHARD H., 3401 Woodland Way, Carlsbad, CA 92008, (760) 434-9808. E-mail: rnegus@adelphia.net

PETWAY TINA, Dept. of Malacology, Houston Museum of Natural History, One Hermann Circle Dr., Houston, TX 77030-1799, (713) 639-4677, FAX (713) 523-4125, E-mail: tpetway@hmns.org

PISOR, DON & JEANNE (new business phone): 868-274-4830

POPPE, PHILIPPE, Conchology, Inc., Cebu Lighthouse Industrial Park, Basak, Lapu-Lapu City, Cebu, Mactan Is., 6015 Philippines. E-mail: philippe@conchology.be

RICE, TOM, P.O. Box 219, Port Gamble, WA 98364. E-mail: editor@ofseaandshore.com

RUTKAS, TERRY & KATHY, 11410 E. Florence Ave., Santa Fe Springs, CA 90670, (562) 941-5439. E-mail: tjrutkas@verizon.net

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### Congratulations to *The Nautilus*

Dr. José Leal, Director of the Bailey-Matthews Shell Museum and Editor of *The Nautilus* announced that *The Nautilus* is celebrating its 120th anniversary in 2006!

The journal published its most recent issue on December 30, 2005. Check the table of contents [http://www.shellmuseum.org/Nautilus/nautilus\\_contents119.html](http://www.shellmuseum.org/Nautilus/nautilus_contents119.html) for titles of the articles published therein.

The journal has been published by The Bailey-Matthews Shell Museum since 1997.

## FIRST PERUVIAN RECORDS OF TWO SPECIES OF CANCELLARIDAE (MOLLUSCA, GASTROPODA)

VALENTÍN MOGOLLÓN AVILA & GRACE VICTORIA MONTALVÁN NARANJOS

Laboratorio de Invertebrados Acuáticos  
Facultad de Oceanografía, Pesquería y Ciencias Alimentarias  
Universidad Nacional Federico Villarreal  
Roma 340, Lima 18, PERÚ  
E-mail: svmogollon@yahoo.com

A specimen of *Trigonostoma (Extractrix) milleri* Burch, 1949, (Figure 3) was collected in August 28, 2004, on a shrimp trawler off Puerto Pizarro, Departamento de Tumbes, Perú. This fresh dead specimen is a new record for the species.

It is now placed in the subgenus *Extractrix* Korobkov, 1955. This subgenus was proposed in the family Architectonicidae for an uncoiled gastropod from the Miocene of Romania. The uncoiled species, *Trigonostoma hoerli* Olsson, 1967, is now known from the Pliocene of the Southeastern United States and Venezuela (Richard E. Petit, pers. comm., Dec. 3, 2005).

*Trigonostoma (E.) milleri* was described from a lot of fifty beach specimens collected by Professor Norman W. Miller near Puntarenas, Costa Rica in 1947. The previously known distribution of *T. (E.) milleri* was Costa Rica (Keen, 1971) but Petit (pers. comm., 1982) expanded it north to off Guaymas, Sonora, México. Finet (1985) extended the range south to the Islas Galápagos, Ecuador, where this species occurs in deeper waters (Petit, pers. comm., Dec. 3, 2005). Some authors consider this species uncommon (Abbott & Dance, 1986), but it can be found with regularity off Isla Arenas de Quebro, Panamá, at depths of 37-72 m (120-240 ft) (Petit, pers. comm., Oct. 16, 2004). The new locality is off Puerto Pizarro, Departamento de Tumbes, Perú (03°30.0'S, 80°23.0'W), in 20-30 m on a mud, sand and shell-grit bottom. The specimen here studied (Figure 3) measures 28.1 x 21.7 mm and is housed in the Carol Skoglund Collection (CS), in Phoenix, Arizona. The maximum length reported for this species is now 29.1 mm for a specimen from Mazatlán, Sinaloa, México (Pisor, 2005).

The second new record is for *Agatrix strongi* (Shasky, 1961) (Figures 1, 2). It was dredged during a

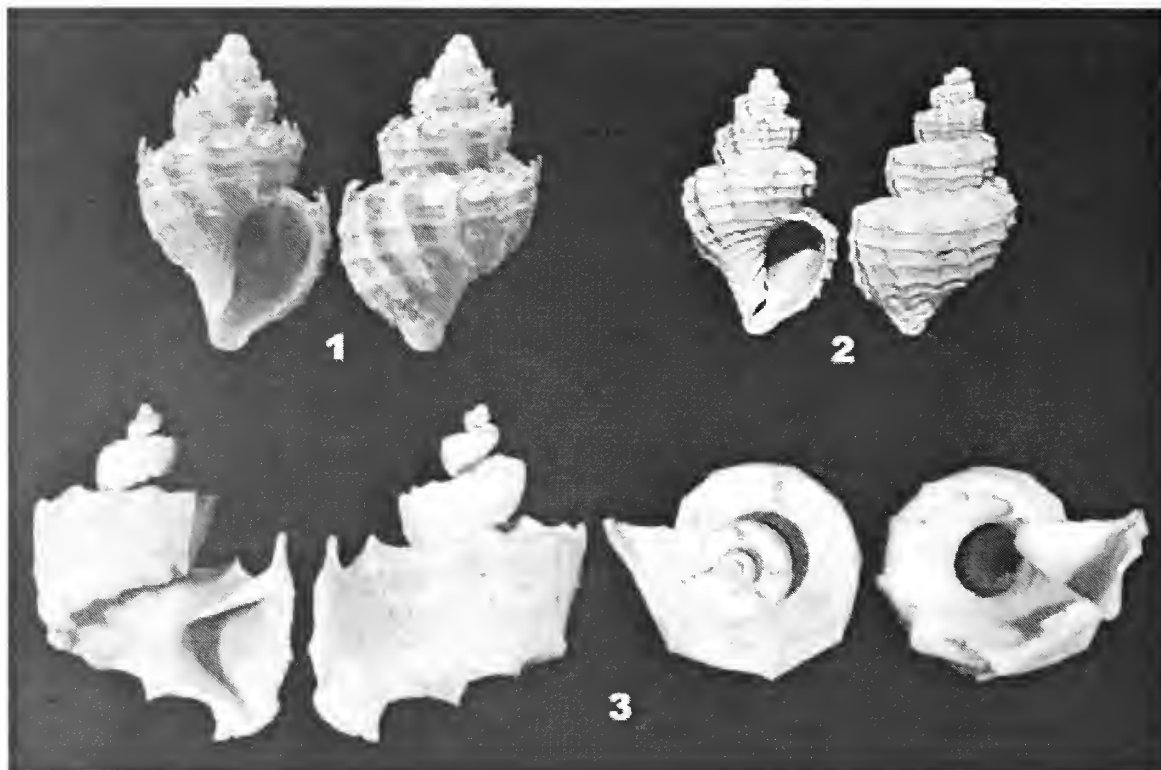
three-day collecting trip to northern Perú, between May 19<sup>th</sup> and 21<sup>st</sup>, 2005, aboard a shrimp boat. A large diversity of mollusks were collected during this survey, several of them not previously recorded in Peruvian waters. The main collecting area was off Caleta La Cruz, Departamento de Tumbes, Perú (03°37.8'S, 80°35.0'W) where fifteen specimens of this species were collected at several stations, in depths ranging between 40-50 m, on muddy bottom. Three of these specimens were live collected, one of which is shown here in Figure 1.

The genus *Agatrix* was described with the western Atlantic *A. agassizii* (Dall, 1889) as type species. The genus is not closely related to *Axelella* as listed by some authors. It is found only in the later Tertiary and Recent faunas of the Caribbean and Panamic (Pacific) areas. Species of the genus are immediately recognizable by the distinct shape of the columella and the tabulate shell shape (Petit, pers. comm., Dec. 3, 2005). Living specimens have tufts of periostracum projecting from the shoulder nodes.

Keen (1971) recorded *Agatrix strongi* in the Golfo de California, from Punta Arena, Baja California, to Guaymas, Sonora, México, offshore in depths of 37-165 m. Petit (pers. comm., 1982, in Skoglund, 2002) extended the distribution on the Baja California side of the Golfo de California, México, to Isla Danzante, in 200 m depth. Skoglund (1988) extended the range north to Bahía de Los Angeles, Baja California, México, in 183 m depth. Hendrickx & Toledano Granados (1994) extended the distribution south to off Mazatlán, Sinaloa, México. Finally, Kaiser (2001) recorded the species south in the Golfo de Chiriquí, Panamá.

The specimens shown here in Figures 1 and 2 measure 8.6 x 5.3 mm and 8.9 x 5.1 mm respectively and are housed in the collection of Carol Skoglund of





Figures 1-3. (1) *Agatrix strongi* (Shasky, 1961), 8.6 x 5.3 mm, live dredged, off Caleta La Cruz, Departamento de Tumbes, Perú, 40-50 m depth, on muddy bottom, May 20, 2005 (CS). (2) *Agatrix strongi* (Shasky, 1961), 8.9 x 5.1 mm, dead dredged, off Caleta La Cruz, Departamento de Tumbes, Perú, 40-50 m depth, on muddy bottom, May 20, 2005 (CS). (3) *Trigonostoma (Extractix) milleri* Burch, 1949, 28.1 x 21.7 mm, dead collected by shrimp trawler, off Puerto Pizarro, Departamento de Tumbes, Perú, 20-30 m depth, on mud, sand and ground shells, August 28, 2004

Phoenix, Arizona. The remaining specimens, several eroded by the acid bottom substrate, range between 5 and 14 mm height and are in the Universidad Nacional Federico Villarreal Collection and Valentín Mogollón Avila Collection, both in Lima, Perú.

#### Acknowledgments

We thank Mr. Richard E. Petit of Myrtle Beach, South Carolina for helping with very important comments and notes about the two species here studied; Mrs. Carol Skoglund of Phoenix, Arizona, and Mrs. Carole Hertz of San Diego, California, who read the manuscript and offered valuable suggestions; to Dr. Mario Peña Gonzáles and Eng. Juan Andrés Kostelac Roca for help aboard the shrimp boat. A special thanks to Eng. Héctor Guevara Díaz, manager of GEOLAB S.R.L. and Dr. Fernando Zúñiga y Rivero manager of BPZ Energy Inc., who supported this collecting trip.

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## MOLLUSCAN DOINGS

### Conchologists of America Sea Treasure – 2006

The 2006 annual convention of COA will be held in Mobile, Alabama with the theme of this year's gathering "Sea Treasure" taken from the book by the late Alabamian Kathleen Yerger Johnstone. The meeting will be held from 31 May to 4 June at the Riverview Plaza Hotel, 64 south Water Street in Mobile.

A full schedule is planned with welcome party, field trips (both shelling and non-shelling), programs, Mobile shell show, silent auctions, bourse, banquet and more.

For further information contact chairman Doug Shelton at <unio@aol.com> or registrar Betty Lipe at <blipe@tampabay.rr.com>.

### "2,400 Years of Malacology"

We are pleased to announce the posting, on the website of the American Malacological Society, of the third edition of *2,400 Years of Malacology* by Eugene V. Coan, Alan R. Kabat & Richard E. Petit (2006), online at <<http://www.malacological.org/publications/epubs.html>>.

"This publication of 664 pages is a comprehensive catalog of biographical and bibliographical papers on malacologists, conchologists, paleontologists, and others with an interest in mollusks. [It] also provides links to online digitized works in systematic malacology... Also, an increasing number of important historical and reference works are also being digitized and made available online.... As before, this catalog is a work in progress, and we plan to continue posting updated versions on a periodic basis. We encourage readers to explore and use this catalog, and we look forward

to receiving your comments, and citations to new or overlooked papers."

Gene Coan, Alan Kabat & Richard Petit

### Student Research Grants in Malacology

As part of their commitment to the continued study of mollusks, the Western Society of Malacologists, the Southwestern Malacological Society, and the San Diego Shell Club are again pleased to announce the availability of grants to support student research in malacology. Funds are available for actual research costs, including but not limited to, field and laboratory equipment, chemicals, photographic supplies, computer time and supplies, microscope usage fees, and some research travel costs.

Eligibility: Applicant must be a full-time student in a formal graduate or undergraduate degree program. There are no citizenship or affiliation restrictions and students from all countries are eligible. The thesis, dissertation, or research project must be focused primarily on the systematics, biology, ecology, physiology, biochemistry, or paleontology of marine, terrestrial or freshwater mollusks. Research currently in progress or beginning in the 2006-2007 academic year will be considered.

Membership in the Western Society of Malacologists is not required but is certainly encouraged and students receive a discounted rate. Award recipients are also encouraged to present their research at a subsequent WSM meeting. Abstracts are published in the WSM Annual Report. Applications must be received by June 1, 2006.

For further information contact: Lindsey T. Groves at (213) 763-3376 (voice); (213) 746-2999 (fax); <[lgroves@nhm.org](mailto:lgroves@nhm.org)>.

## REVISED GENERIC PLACEMENT OF *TRANSENNELLA HUMILIS* TO *NUTRICOLA*

JAYA NOLT<sup>1</sup>

Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,  
Santa Barbara, CA 93105, USA  
E-mail: jayanolt@yahoo.com

### Introduction

The generic status of *Transennella humilis* Carpenter, 1857, has been in question since 1982, when Bernard described the genus *Nutricola*. The genus was established to incorporate cold-water bivalves that were placed with the warm-water *Transennella* Dall, 1884. Keen (1971) had previously placed the tropical *humilis* into *Transennella*.

In order to resolve the placement of *Transennella humilis* I made morphological comparisons between *Nutricola* [type species *N. tantilla* (Gould, 1853)] from the eastern Pacific, and *Transennella* [type species *T. conradina* Dall, 1883] from the western Atlantic. Shell morphology, including pallial sinus, anterior lateral tooth, cardinal teeth, lunule, escutcheon, internal margins, and placement of the ligament, were documented using scanning electron micrographs. The images were compared and contrasted, and these features used to define the differences between the genera. These features were then compared with the images of *N. humilis*.

Additional observations of asynchronous brooding in *Nutricola humilis* are documented. Internal anatomy of *N. tantilla* and *Transennella conradina* are examined, and other *Transennella* species were examined for morphological features similar to those of *T. conradina*.

### Methods

Dried bivalve specimens were cleaned in an ultrasonic cleaner with water, dried, and mounted on stubs for use in a scanning electron microscope (SEM;

Ziess EVO 40 XVP: Carl Zeiss, Ltd., Germany). Some specimens were sputter coated with gold; those that were not were imaged before a sputter coater was available.

### Format

Amended descriptions of the genera *Transennella* and *Nutricola* and the species *T. conradina*, *N. tantilla* and *N. humilis* are given, as well as references to type lots. Materials examined are listed after each description. Differences between Bernard's original description of *Nutricola* and the amended description are discussed. The images of morphologic features are referenced and compared between the type species *Transennella conradina* and *Nutricola tantilla* to *Nutricola humilis*.

Abbreviations used are SBMNH - Santa Barbara Museum of Natural History, California, USA, AMNH - American Museum of Natural History, New York, New York, USA, and UCSB - University of California, Santa Barbara, USA.

### Systematic Results

#### Genus *Transennella* Dall, 1884

*Transennella* Dall, 1884. Type species (M): *Cytherea* (*Transennella*?) *conradina* Dall, 1884. Recent, western Atlantic.

Shell trigonal, pointed posteriorly. External sculpture of commarginal striae. Periostracum smooth, shiny. Beaks not prominent; pallial sinus

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<sup>1</sup>Mailing address: 709 Stanley Street, Oceanside, CA 92054, USA.

moderately deep, angular. Anterior lateral tooth in left valve. Central cardinal tooth of left valve bifid. Internal margins obliquely grooved from ventral to dorsal margins both anteriorly and posteriorly.

***Transennella conradina* (Dall, 1884)**

(Figures 1, 2)

*Cytherea* (*Transennella*) *conradina* Dall, 1884: 340. USNM 91933. Type locality: Cedar Key, Florida, USA.

**Diagnosis**

Shell trigonal, pointed posteriorly, moderately inflated. External sculpture of commarginal striae. Periostricum smooth, shiny; shell nearly white, with fine yellow zigzag marks, a bit of pink internally in some valves. Beaks not very prominent, prosogyrate; escutcheon absent; lunule impressed. Ligament sunken, opisthodontic. Pallial sinus angular, moderately deep. Anterior lateral tooth in left valve close to cardinal teeth, corresponding groove in right valve. Central cardinal tooth of left valve bifid. Internal grooving on shell margins. Internal grooves oblique, deep, extending from ventral margins up to beaks both anteriorly and posteriorly. Maximum length 1 cm.

**Materials examined**

AMNH 312721, 1 wet specimen from Tampa Bay, Florida, USA, length = 9 mm; SBMNH 102371, 3 dry from Gordon's Pass, Florida, USA, length = 8 mm; SBMNH 55333, 1 dry specimen from Sanibel Island, Florida, USA, length = 10 mm.

**Genus *Nutricula* F. R. Bernard, 1982**

*Psephis* Carpenter, 1865, *non* Guenée, 1854. Type species (OD): *Chione lordi* W. Baird, 1863. Recent, northeastern Pacific.

*Psephidia* Dall, 1902, *non* Pomel, 1872, *nom. nov. pro Psephis* Carpenter, *non* Guenée.

*Nutricula* F. R. Bernard, 1982: 147. Type species (OD): *Venus tantillus* A. A. Gould, 1853. Recent, northeastern Pacific.

Shell ovate to trigonal. Beaks not prominent. External sculpture of weak commarginal striae. Periostricum thin, shiny. Lunule obscure to absent; escutcheon absent. Ligament sunken. Pallial sinus shallow to moderate, u-shaped to triangular. Anterior

lateral tooth, if present, in left valve close to cardinal teeth. Center cardinal tooth non-bifid. Internal dorsal and ventral margins smooth or with weak commarginal striae. Internal asynchronous brooding in mantle.

***Nutricula tantilla* (Gould, 1853)**

(Figures 3, 4)

*Venus* (*Trigona*) *tantillus* A. A. Gould, 1853: 406, pl. 15, fig. 10. Type locality: Santa Barbara, California, USA.

**Diagnosis**

Shell ovate to trigonal. External sculpture of weak commarginal striae. Periostricum thin, shiny, often with some corrosion near beaks. Shell varies from white with light brown chevrons to purple with dark bands on posterior side and on umbones. Internal shell white, with brown or purple in some. Beaks not prominent, orthogyrate; lunule obscure; escutcheon absent. Ligament sunken, opisthodontic. Pallial sinus moderately deep, u-shaped. Moderately large anterior lateral tooth in left valve close to cardinal teeth, corresponding groove in right valve. Inner dorsal margin contains weak commarginal striae; deep oblique grooves absent. Inner ventral with weak commarginal striae, absent in some. Maximum length 9 mm.

**Materials examined**

SBMNH 80146, 1 wet specimen from Morro Bay, California, USA, length = 6 mm; SBMNH 80147, 1 dry specimen from Morro Bay, California, USA, length = 4 mm; SBMNH 359049 2 dry specimens from Alki Point, Washington, USA, length = 4 mm, 3.5 mm; SBMNH 33001, 1 dry specimen from Fort Lawton, Seattle, Washington, USA, length = 6 mm.

***Nutricula humilis* (Carpenter, 1857)**

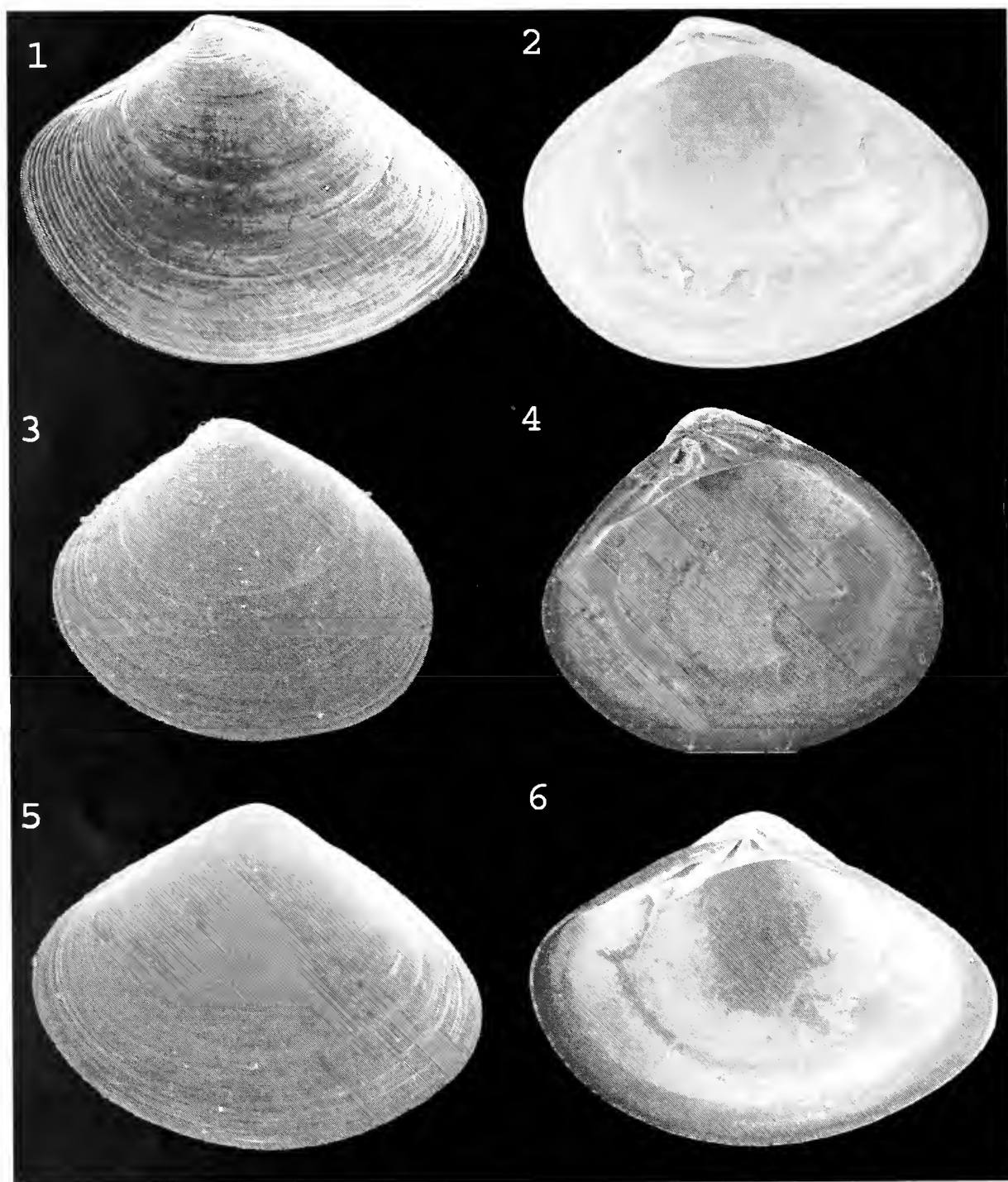
(Figures 5, 6)

*Trigona humilis* Carpenter, 1857a: 246, *nom. nud.*; 1857: 57. Lectotype BMNH uncataloged, Carpenter Collection, tablet 244. Type locality: Mazatlán, Sinaloa, México.

**Diagnosis**

Shell trigonal. External sculpture with weak commarginal striae. Periostricum thin, shiny. Shell from white to some with brown chevrons or purple at umbones and posterior sides. Internal shell white, with





Figures 1-6. (1,2) *Transemmella conradina*: SBMNH 102371, Gordon's Pass, Florida, USA [26°05'N, 81°48'W], size = 8 mm. (3,4) *Nutricula tantilla*: SBMNH 359049, Alki Point, Seattle, Washington, USA [47°34'N, 122°25'W], size = 4 mm. (5,6) *Nutricula humilis*: SBMNH 132107, Bahía de los Angeles, Baja California, México [28°55'N, 113°32'W], size = 4 mm.

purple or brown in some. Lunule obscure; escutcheon absent. Beaks not prominent, orthogyrate. Ligament deeply sunken, broad, opisthodontic. Pallial sinus moderately deep, angular. Anterior lateral tooth of left valve close to cardinal teeth, corresponding groove in right valve. Inner ventral and dorsal margins with weak commarginal striae. Maximum length to 7mm.

### Materials examined

SBMNH 132107, 5 specimens dry from Bahía de los Angeles, Baja California, México; length = 3 at 4 mm, one at 5 mm and one at 6 mm; SBMNH 357146, 2 dry specimens from Punta la Gringa, Baja California, México, length = 4 mm.

### Discussion

Examination of *Nutricula tantilla* yielded certain characters that differed from Bernard's original description of *Nutricula*. The ligament in *N. tantilla*, contrary to the description of an amphidetic ligament, is opisthodontic. The persiostricum creates the appearance of ligament crossing the beaks anteriorly. Bernard also portrayed a minute pallial sinus. The specimens that I examined showed a moderately deep sinus; however, it might be shallower in other individuals.

The characters of *Transennella conradina* matched with Dall's original description. The most distinguishing feature being the grooved margins, "the most remarkable feature of this shell is the internal grooving of the margins ... I have seen nothing like it in any other bivalve" (Dall, 1884). Lindberg (1990) considered the internal grooving on the margins a feature which distinguishes members of the genus *Transennella*.

In separating the genera *Transennella* and *Nutricula* the key differentiating morphological features between them are; lunule, the left central cardinal tooth, and the inner ventral and dorsal margins. These characteristics for *T. conradina* show a defined lunule, a bifid central cardinal tooth, and deep oblique grooves on the inner margins (Table 1). *Nutricula tantilla* has an obscure lunule, ungrooved central cardinal tooth, and only commarginal striae on the inner margins, weak to absent on the ventral margin (Table 1). Comparing *N. humilis* with these features, one can see that, as in *N. tantilla*, the lunule is obscure, the central cardinal tooth in the left valve is ungrooved, and there are similar commarginal striae on the inner margins (Table 1).

Internal examination of the anatomy of *Nutricula tantilla* and *Transennella conradina* showed differences

in certain structures. *Nutricula tantilla* possessed a smaller outer demibranch and larger inner demibranch. Only one wet specimen of *T. conradina* was obtained and it had previously been dissected. In accordance with Bernard (1982), the demibranchs may have been of similar size. However, additional specimens would be needed to verify this. The labial palps in *N. tantilla* are long and finger-like. *Transennella conradina*'s labial palps had papillae and were shorter by comparison. The adductor muscles in *N. tantilla* were oval in shape and relatively the same size. *Transennella conradina*'s anterior abductor muscle was larger than the posterior muscle, and both were oval to more circular in shape.

Bernard (1982) chose *Nutricula*, which means "little nurse" in Latin, to reflect the brooding habit of *N. tantilla*. Brooding in "*Transennella*" *humilis* was noted by Lindberg (1990) and is pictured here (Figure 7).

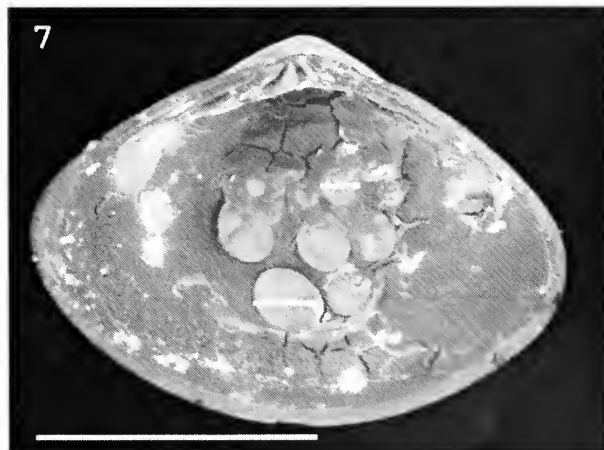


Figure 7. *Nutricula humilis*, with brood; SBMNH 132107, Bahía de los Angeles, Baja California, México [28°55'N, 113°32'W]. Scale bar = 1 mm.

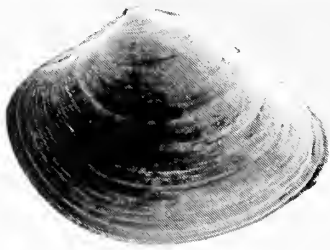
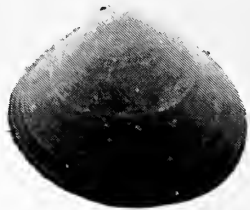
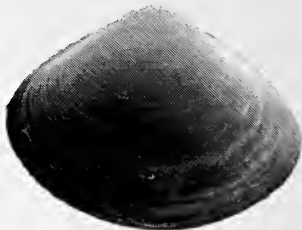
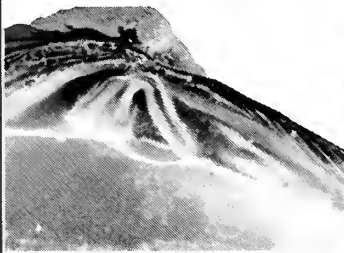

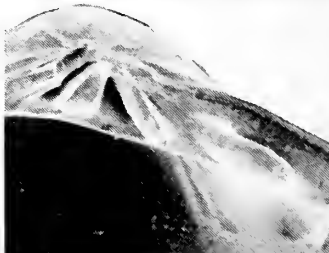
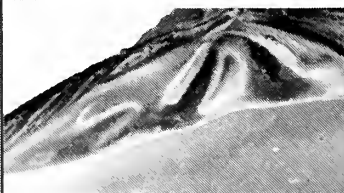
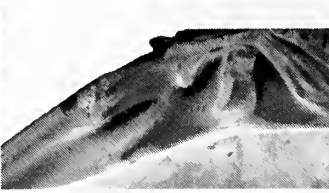
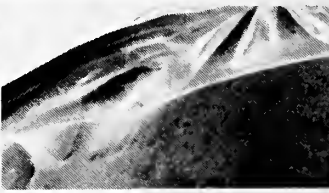
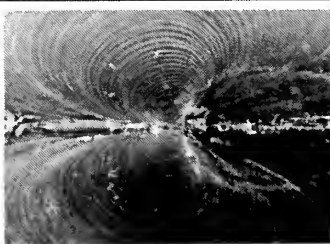


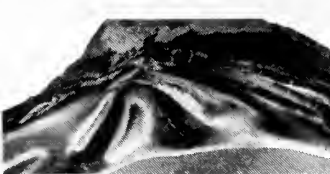

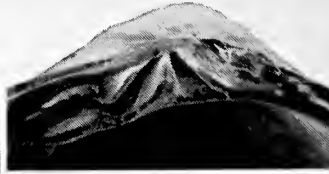
Bernard (1982) stated that *T. conradina* produced small planktotrophic eggs. References to *Transennella* species brooding were not found. One wet specimen of *T. conradina* and three dry were examined for possibility of brood, and none were found.

I examined other species of *Transennella* from the Caribbean and Panamic Provinces including *stimpsoni* (Dall, 1902), *puella* (Carpenter, 1864), *modesta* (G. B. Sowerby, 1835) and *galapagana* (Hertlein & Strong, 1939) for morphological characteristics that would relate them to *T. conradina*. Only *T. stimpsoni* contained a bifid central cardinal tooth and oblique grooves along the dorsal margins; the others possessed striae that were




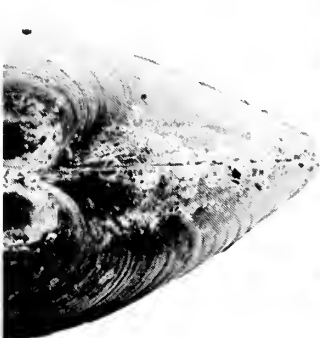
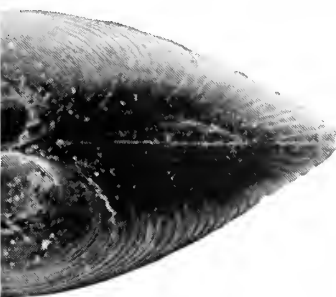

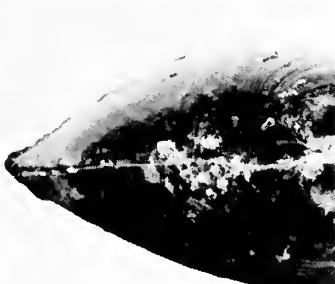
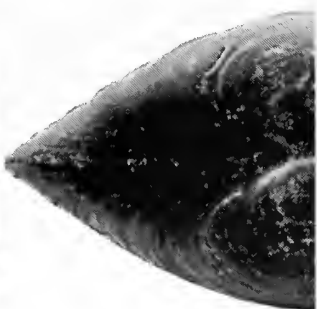
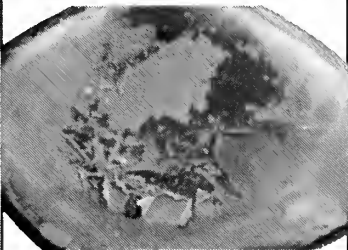
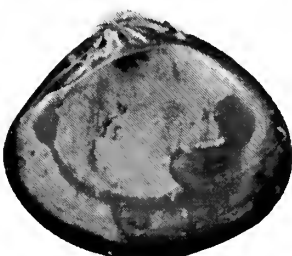
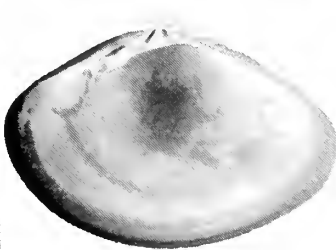
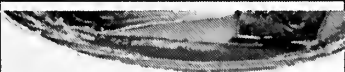
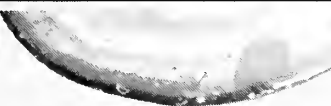
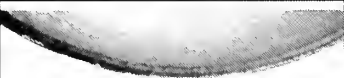
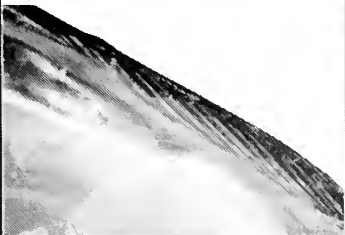
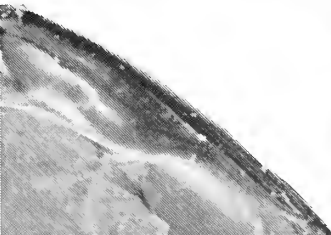
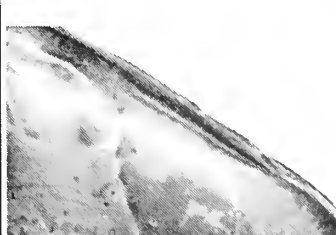
Table 1. Comparison of Shell Characters of the Three Species

*Transennella conradina* SBMNH 132107, Gordon's Pass, Florida, size = 8 mm. *Nutricula tantilla*, SBMNH 339049, Alki Point Seattle, Washington, size = 4 mm, except for anterior groove and internal ligament SBMNH 33001, Fort Lawton, Seattle, Washington, size = 4 mm. *Nutricula humilis*, SBMNH 132107, Bahía de los Angeles, Baja California, México, size = 4 mm.

Characters	<i>Transennella conradina</i>	<i>Nutricula tantilla</i>	<i>humilis</i>
External Sculpture and Shape			
Cardinal and Lateral Teeth			
Anterior Groove			
Ligament			
Internal Ligament			

Continued on page 46.

Table 1, continued

Characters	<i>Transennella conradina</i>	<i>Nutricula tantilla</i>	<i>humilis</i>
Lunule			
Escutcheon			
Pallial Sinus			
Inner Ventral Margin			
Inner Dorsal Margin			



more like crenulations or even commarginal. This warrants future examination of the generic placement of these species and perhaps possible revisions.

In conclusion, *Nutricula humilis* should be placed in the genus *Nutricula*. The morphological features of an ungrooved central cardinal tooth, a weakly defined lunule, and most importantly the commarginal striae on the internal margins define it to be akin to *N. tantilla* rather than *T. conradina*. The fact that *N. humilis* also broods its young ties it in with the genus *Nutricula*. This study gives way to possible future research in examining the species placed in the genus *Transennella*.

#### Acknowledgments

This study was made possible by a grant from NSF (MRI0420726). I would like to thank Paul Valentich-Scott (SBMNH) for his guidance, without him this paper would not have been possible, Daniel Geiger (SBMNH) for his training on the SEM, Paula Mikkelsen (AMNH) and Marla Coppelino (AMNH) for facilitating a loan of a wet specimen of *T. conradina*, Shane Anderson (UCSB) for acquiring live *Nutricula tantilla* and Carol

Skoglund of Phoenix, Arizona, for her donation of one lot of *Nutricula humilis*.

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# THE FESTIVUS

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## PROGRAM

Paleontology and Geology of the Imperial Sea – Pectens and Snails and Sea Biscuits. Oh my!

Dr. Tom Démeré, Curator of the Paleontology  
Department at the San Diego Natural History Museum,  
will give a PowerPoint presentation highlighting the

invertebrate fauna of the Imperial Group from the Salton  
Trough and discussing its affinities to the Tertiary  
Caribbean Province.

Meeting date: May 18, 2006

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## CLUB NEWS

### The Billee/Twila Auction

Words can't describe the 2006 Auction/ Potluck. One would need a basket full of adjectives/adverbs with the word "most" preceding them – incredible, fabulous, jubilant, exorbitant, priceless, hilarious, delicious, sumptuous, relaxing, congenial, exhausting, merry – and on and on. All said, it was THE MOST!

The over 45 members and guests arrived early and enjoyed "Dave's Punch" as prepared by John LaGrange, visited with friends as they streamed in to host Wes Farmer's clubhouse, and carefully examined the treasures on the voice auction table and browsed the shell-rich silent auction tables.

Dinner was announced promptly at 6 p.m. The SDSC group loves to eat and the delicious, plentiful food – most everything homemade – from fruit salads to lumpia, to marvelous casseroles was enjoyed by all.

It was a time to eat and chat with friends until at 7 p.m. on the button, auctioneer Carole Hertz welcomed the group and introduced Billee and Twila, whose generosity made this fantastic event possible. They received well-deserved applause and audible thank-yous from the audience. Billee had stated as she entered the room that she didn't think she'd do any bidding since she'd had all the shells already!!

The auction started out feisty and exciting and the enthusiasm never stopped, from the opening with *Strombus thersites* which received aggressive bids to the end of the evening, some four hours later.

During the first half of the evening there were some very rare shells auctioned, but the greatest interest was in a very large, perfect, but strangely, lightly colored *Cypraea mauritiana* which went for \$700. At the closing bid the audience broke into spontaneous applause and cheers.

As is traditional at the Club auctions, there is a break in the middle for more dessert and coffee, to lock up the silent auction bids and to dive into two tables of \$1 shells. It's lots of fun and some who'd paid prime prices for shells were happily scooping up \$1 shells.

During the second half of the auction there were many more choice shells. A live-collected specimen

of *Sthenorys turbinum* was the star of the evening. As the energetic bidding continued, the price went beyond the \$700 top price of the first half and passed \$1,000 finally selling at \$1200. The room just broke into clamorous applause while the auctioneer remained in a state of disbelief!

By 11 p.m. the last shell had been sold and the silent auction winners had received their winnings. Before all the goodbyes were said, members generously pitched in and helped with the cleanup, putting the room back in order. More than just a note of thanks is extended to the Club Board and to host Wes Farmer for making the event happen.

It was a very special evening and members left happy, weary – and a bit poorer than when they arrived.

### The Greater San Diego Science and Engineering Fair

Once again the San Diego Shell Club has participated in judging at the Greater San Diego Science and Engineering Fair. Club judges this year were Terry Arnold (Chair), John LaGrange and Larry Lovell. They found this year's Club winner in the Junior Division, a first for the Club.

Ben Smith, an 8<sup>th</sup> grader at St. Johns School in Encinitas, entered in the Earth Sciences category. His project, *Fossils of the Bay Point Formation*, is the Club's choice. Ben has chosen as his book award from the Club, Barnes' *Invertebrate Zoology*. Ben will come to the Club's June meeting to present an overview of his winning project and receive his award and the congratulations of the membership.

### Too Late for the Roster

LIFF-GRIEF, PHIL, 2447 Kemper Ave., La Crescenta, CA 91214, (818) 541-1232, E-mail: [pliffgrieff@sbcglobal.net](mailto:pliffgrieff@sbcglobal.net)  
REITZ, CHARLES K., 410 Orpheus Ave., Leucadia, CA 92024, (760) 943-1029 (home), (760) 471-8657 (work), Fax (760) 471-6894.

### Change of address

LOVELL, LARRY, Biologist II, Marine Biology Laboratory, JWPCP, CSDLAC, 24501 S. Figueroa St., Carson, CA 90745, (310) 830-2400 ext. 5613 (office), (760) 803-1608 (home), E-mail: [111polytax@cox.net](mailto:111polytax@cox.net)

### Correction of phone number

Pisor, Don & Jeanne (business number) 858-274-4830.

## THE FESTIVUS THE MAKING OF A SCIENTIFIC JOURNAL

JULES HERTZ<sup>1</sup> & CAROLE M. HERTZ<sup>1</sup>

Associates, Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road  
Santa Barbara, California 93105, USA

*The Festivus*, a publication of The San Diego Shell Club, originated in 1970. The current Club was founded in 1961 with 51 charter members. There had been an earlier San Diego Shell Club established in 1931 which ceased activity long before the current club came into existence. Shortly after the new Club was formed, The San Diego Shell Club joined the Western Association of Shell Clubs, which consisted of the Conchological Club of Southern California, Pacific Shell Club and Northern California Malacozoological Club. Together they put out a combined publication called the *News of the Western Association of Shell Clubs*. Distribution was limited to members in good standing of the participating Clubs. The leading force in this venture was Dr. Rudolf Stohler, who in 1958 was instrumental with others in starting the journal *The Veliger*, then a publication of the Northern California Malacozoological Club. The contributing members of the *Western Association...* would send their newsletter inputs to Dr. Stohler and his daughter Heidi. The copy was required to have a specific number of letters and spaces per line to facilitate formatting. Heidi would then coordinate, type and distribute the combined inputs on a bimonthly and sometimes irregular basis. The *News of the Western Association of Shell Clubs* served as the San Diego Shell Club's method of distributing news to its membership and was augmented by a phone committee.

In November 1969 the Club's President, Nola Michel, was advised that the Pacific Shell Club would no

longer be participating in the *News of the Western Association...* Member Cliff Ames made a motion at the Club's November meeting that The San Diego Shell Club publish its own newsletter for its members and no longer be involved with the Western Association of Shell Clubs. This motion was seconded and passed by a small margin by all members present. Blanche Brewer was appointed Editor. John Souder, Dave Mulliner, Nola Michel, Carole Hertz and Norm Currin would make up the News Committee.

All the members working on the publication met at John and Nola Michel's home and established their vision for the publication. It was named *The Festivus* in honor of the beautiful local *Murex festivus* Hinds, 1844, now known as *Pteropurpura festiva*. There were to be no advertisements, no naming of new species, no poetry or Club chitchat such as birthday announcements, and no reprinting of articles from other shell publications. *The Festivus* would be sent each month in time to announce the monthly speaker and topic. There would be a page devoted to the minutes of the previous meeting, upcoming social events, announcement of new members, changes of addresses, etc. There would be eleven issues a year since no-one was interested in working during the December holiday season. The publication would contain articles on shells, marine life, notes on shelling trips, collecting methods, aquarium observations, and local tide information. There would be no standard size to the monthly issues, rather

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<sup>1</sup> Mailing address: 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA. E-mail: cmhertz@pacbell.net



they would vary depending on the size of the articles submitted.

The first issue of the resulting newsletter, *The Festivus*, was published in January 1970. It began with the following statement: "Our avowed intention is to make this a monthly publication - to mail it to your homes before the regular meeting so you will know the projected program and to remind you of the meeting date. (Telephone notice will not be given unless personally requested). With an editorial staff having specific duties, publication will be organized and simplified. Our staff is composed of: Reporters: Clifton Martin, Clifford Martin, Normin (sic) Currin and John Souder - Coordinating Chairman: Nola Michel - Publishing: Dave Mulliner - Distribution: Virginia Hanselman - Editor: Blanche Brewer. We can earnestly invite your participation as contributors. With it we can have an informative and enjoyable magazine and - let's face it - without it, no magazine at all."

Blanche Brewer had been The San Diego Shell Club's editor from 1967-1969 while the Club was contributing to the *News of the Western Association*.... She had no typewriter nor could she type, so other members helped her in providing the input to Dr. Stohler and Heidi. Blanche continued as editor of *The Festivus* from 1970-1975. Carole Hertz did the typing using the Hertz's Smith Corona portable typewriter either at the Brewer's home or the Hertz's home. The reporters provided copy each month which was assembled, edited and typed. The issues were mimeographed the first year. They were prepared on ditto masters during the second year.

*The Festivus* published its first illustrations, a series of sketches of the various patterns of the species in the *Conus textile* and *omaria* complexes, in September 1970. These sketches were done by noted artist and member Anthony D'Attilio and were to be followed by many years of his illustrated articles. Even with all the devoted help, filling an issue and making a monthly deadline was a difficult proposition. Despite the definite dos and don'ts that were originally established, there were a few "poems" that made it into early issues.

For the first few years, each issue was numbered separately starting with page 1. It wasn't until 1973 that *The Festivus* used consecutive numbering for the entire year. The February 1970 issue was the first to have a masthead and logo. The masthead had the word "Festivus" in one-inch bold letters and included the shell logo, an illustration of *Pteropurpura festiva* adapted from an existing Anthony D'Attilio drawing. The masthead was designed by member Art West who owned a print shop in Chula Vista. It was also incorporated in

stationary for *The Festivus*.

In May 1972 *The Festivus* published an article by Nola Michel, entitled Aquarium Observations, accompanied for the first time by photographs. One of the photographs was by Dave Mulliner, who for the next 30 years was to become first the unofficial photographer and later the official Staff Photographer for *The Festivus*. *The Festivus* was probably the only publication whose staff photographer not only made house calls but developed the negatives as well. Dave only charged the publication for the cost of the film and developing supplies. Without his great support, the publication might have perished many years ago. The issues gradually became more advanced technically and more interesting. Photographs were "ganged" into sheets to minimize costs and were taken to the instant print company where they were made into half-tones. These were later cut to size and pasted into the copy before going back to the printer for the final printing.

Starting with the third year, the monthly issues were reproduced at a local instant print shop and later at the instant print section of Neyenesch Printers Inc. Collation and stapling were done by Carole Hertz, Barbara Myers and other volunteers. The issues were prepared for mailing by Virginia and George Hanselman and Carole Hertz using preprinted labels for both the members' addresses and the return address which at that time was the Hanselman's home address. The earliest issues required six-cent postage, and the stamps and address labels were often affixed to the last page of the issue, if it was at least partially blank. The Club dues at that time were \$3.00 a year and with a yearly Club auction covered the costs of *The Festivus*.

By 1973 some of the articles were submitted by authors fully typed and ready to print. So for the first time in the history of *The Festivus* there were issues where font style and size varied from article to article. There were also some instances where hand-written letters to individual members of the Club were pasted into issues and published. Since there still were no guidelines for submitted articles, margins sometimes were inconsistent and in some cases almost non-existent.

*The Festivus* began publishing annual low tide lists early each year for both San Diego and the upper Gulf of California, so members could plan their shelling trips in advance. In recent years the best low tides of the year for San Felipe and/or Puerto Peñasco are published in the January issue. In the beginning, membership lists were published each year as part of the April issue; in recent years the membership list is a standardized part

of the February issue.

The Hertzes were approached by Norval Brewer at the end of 1975, stating that his wife, Blanche, then in her late 80s, would like to retire from the editor's position. She realized that Carole was doing most of the work and she felt it had become mainly an honorary title. With the approval of the board of The San Diego Shell Club, Carole Hertz became the official editor of *The Festivus* in 1976. She has continued as editor for the past 30 years.

In March 1976, Jules Hertz wrote a small article entitled "Minute Shells" with photographs by Dave Mulliner. The article started as follows: "With this issue, *The Festivus* is starting what hopefully will be a monthly feature. It has long been recognized that some of the most beautiful marine shells are minute (less than one-half inch). There are relatively few amateur collectors of minute shells mainly because of the amount of time required for gathering and sorting grunge, the difficulties in obtaining species' identifications and the problems in properly displaying the shells. It is hoped that by obtaining good photographs of minute shells with accurate data, the interest in minatures will greatly increase. In many cases the identification of the shells will be unknown, and the naming of the shells or other comments from the readership will be greatly appreciated and printed in future issues." This concept was feasible because Dave Mulliner and Bert Draper had developed the ability to take high-resolution, high-magnification photographs of shells as small as 1-2 mm. With the help of Club members who were divers, grunge was obtained locally and from places like the Islas Galápagos. The articles on minute shells continued until 1982. In this time period, *The Festivus* had no review board and this coupled with the need to publish quickly because of lack of a backlog of articles led to mistakes in identifications. In a number of cases corrections were required in succeeding issues. At times the first author was told by the editor that a Minute Shell article was imperative if he was to have dinner that evening!

In 1977 *The Festivus* made a goof of gigantic proportions and of historic significance. The January to August 1977 issues were all properly reported as part of Volume VIII. For some unknown reason, the issues for September through November were all listed as Volume IX. It wasn't discovered until well into the following year (Volume X) when librarians from national and international institutions sent inquiries about "missing issues" and by then it was too late to correct the problem. For many, many years since then, requests

from confused librarians have continued, requesting the missing parts of Volumes VIII and IX.

*The Festivus* published its first Special Issue in February 1978, the George E. Radwin Memorial Issue in memory of Dr. Radwin who had come to San Diego in 1968 to become Chairman of the Department of Marine Invertebrates at the San Diego Natural History Museum and died at the early age of 37. This issue had an illustrated card-stock cover designed by Anthony D'Attilio featuring his illustration of *Murexiella radwini*. It began with some biographical notes by Anthony D'Attilio and included pictures and names of genera and species in honor of Dr. Radwin, a list of new taxa described by him and a bibliography of his writings.

The second Special Issue, published in October 1978, was a *Catalogue of Coralliophilidae* by Anthony D'Attilio. It consisted of all nominate taxa proposed for the family Coralliophilidae, specific and supraspecific. It contained a catalogue of genera in alphabetical order with genus name, author and date, type species, and type reference. This was followed by a catalogue of species also arranged alphabetically with the same format. The third Special Issue, published in November 1979, was *Interpretation of Typhine Morphology with Special reference to Typhisala clarki* (Keen & Campbell, 1964) by Joyce Gemmell and Anthony D'Attilio with detail drawings by D'Attilio highlighting sculptural features.

*The Festivus* first published high-magnification photographs taken with a scanning electron microscope in February 1979. These were photographs of *Cypraea radulae* and were part of an article written by Hugh Bradner entitled "The Sharp-Tongued Mollusks." The photographs were taken at magnifications as high as 500X.

At the beginning of 1979, *The Festivus* published its first cumulative index for the years 1970-1977 (Volumes I-IX). Annual selected indices in the November issues followed beginning with Volume X (1978). Cumulative indices were published in 1987, 1996 and 2006, the last two being indexed by both author and subject matter.

In October 1980 the San Diego Shell Club purchased a very good used IBM Correcting Selectric typewriter for *The Festivus*. It was used for the first time to type the November issue. At the same time, *The Festivus* went to heavier paper stock. This resulted in a quantum jump in appearance. No longer were correcting errors a major headache; no longer was there a need for correcting fluid or correcting tape.

Another milestone occurred in January 1984 when *The Festivus* published its first supplement. It was

entitled *Illustrations of the Types Named by S. Stillman Berry in his "Leaflets in Malacology"* and was written by Carole M. Hertz. It was 42 pages long and had 92 photographs by Leroy Poorman. It was a significant addition to molluscan literature since Berry had only illustrated two type specimens of species he described in the "Leaflets" (excluding octopus species).

*The Festivus* had a sleek new look for 1984. The new cover design was created and prepared by graphic designer, Suzanne Hertz, who generously provided her services to the San Diego Shell Club. It was more modern in appearance but still incorporated the shell logo, although much smaller in size. *The Festivus* had applied for and obtained an eight-digit International Standard Serial Number (ISSN) which identifies periodical publications and this number was incorporated in the newly-designed masthead. The Club also started to send *The Festivus* yearly to the Zoological Society of London to be included in the Zoological Record.

Joyce Gemmell, Carole Hertz and Barbara Myers started working on the Joyce Gemmell Collection in 1979 while volunteering at the San Diego Natural History Museum. This was a unique collection of material that Gemmell had collected in the San Felipe area over a period of eleven years while she and her husband Bill lived there. The study of the collection led to many significant papers published in *The Festivus* from 1979 to 1995. In March 1980 the three researchers authored a Special Issue entitled *Seastar Predation on Mollusks in the San Felipe Bay Area Baja California, Mexico*. In February 1987, *The Festivus* published a supplement by the same three authors entitled *A Faunal Study of the Bivalves of San Felipe and Environs, Gulf of California, from the Gemmell Collection (1965 to 1976)*. This 72-page document had 79 illustrations to complement the text with all drawings done by Gemmell.

Another major contributor to *The Festivus* during this same period was Anthony D'Atilio. He was prolific in his writings on the different families. With his background as an artist and scientific illustrator he was able to illuminate the sculpture, radulae, protoconchs, etc. of many muricid species, his favorite group of mollusks.

As the contents of *The Festivus* improved our readership changed. What had started as a Club publication became recognized nationally as well as around the world. Our subscribers started to include world-wide museums and overseas collectors. This also led to articles being submitted by a more diverse group of individuals. The total number of subscribers (Club

members) increased. The concept of having Club members as reporters providing monthly inputs had passed. Many of those early contributors and helpers either died or lost some of their enthusiasm and maintaining the publication was shared by fewer people. It wasn't until September 1995 that some of the distribution tasks were reduced by getting the monthly issues collated and stapled by the printer. However, the biggest task always remained the same - maintaining a sufficient backlog of articles.

Another major event in the history of *The Festivus* occurred in 1985. This resulted from strong urging by Dr. Eugene V. Coan that the publication be peer reviewed by a Scientific Review Board. This idea had been considered for a long time but had been put off for fear that the delay in getting papers to print would lead to problems in having enough articles to meet monthly requirements. In January 1985 the front page of *The Festivus* was modified to include a Scientific Review Board of nine professional malacologists versed in diverse fields. Contrary to our fears there were no adverse effects and, in fact, more researchers began submitting papers. It also led to higher quality in the papers because of the valuable suggestions by the reviewers. Over the years the number of reviewers has increased and there are currently 13 members on the Review Board.

In November 1988, *The Festivus* published another supplement, *An Illustrated Catalogue of the Family Typhidae Cossmann, 1903 (Gastropoda: Muricacea)* by Anthony D'Atilio and Carole M. Hertz. This 73-page catalogue has 109 illustrations of shell morphology and radular characters for the then known typhid species. It is still one of the most frequently sought supplements published by *The Festivus*.

*The Festivus* entered the age of color in 1990 in an article by George Hanselman showing Hanselman's beautiful photos of the sculpture and girdle hairs of *Mopalia* species. The colors were not as vibrant as those in a plate published in 1991 showing different color forms of *Pteropurpura festiva* as well as photos of *Favartia guamensis* and *Oliva spicata*. This latter color plate was done at Classic Reprographics and was very expensive. It was hoped that the publication might afford to publish one or two such plates if the annual auction fundraiser was successful.

*The Festivus* entered the computer age in 1990. The first issue using computer-generated text was in August of that year: it went to a two-column format, the copy was generated in WordPerfect, the margins were



standardized and general appearance greatly improved.

A series of supplements on Panamic literature updating the information in A. Myra Keen's *Sea Shells of Tropical West America*, second edition were written by Carol Skoglund starting in 1991. The two published in 1991 were *Additions to the Panamic Province Opisthobranchia (Mollusca) Literature 1971 to 1990* and *Additions to the Panamic Province Bivalve (Mollusca) Literature 1971 to 1990*. This was followed in 1992 by *Additions to the Panamic Province Gastropod (Mollusca) Literature 1971 to 1992*, and again followed respectively in 2001 by *Panamic Province Molluscan Literature Additions and Changes From 1971 through 2000, I Bivalvia, II Polyplacophora* and in 2002 by *Panamic Province Molluscan Literature Additions and Changes From 1971 through 2001, III Gastropoda*.

Starting in 1993, *The Festivus* published a series of articles and supplements by Kirstie L. Kaiser on the marine mollusks of the islands of the tropical eastern Pacific. These have included major works published as supplements on the species found in the Islas Galápagos [*The Recent Molluscan Marine Fauna of the Islas Galápagos*] (1997, 67+pp.), Isla de Malpelo [*The Recent Molluscan Marine Fauna of Isla de Malpelo, Colombia*] (2001, 149+pp, 5 color pls, 49 b&w pls.), and preliminary papers on species found off México and Panamá, at Isla del Coco and at Île Clipperton. Additional works in this series are planned in the near future. *The Festivus* has also published many articles on the marine mollusks of the islands in the tropical eastern Pacific by Henry Chaney, William K. Emerson and Michael Small.

In 1996 *The Festivus* featured a Special Issue by Carol Skoglund and David K. Mulliner entitled *The Genus Spondylus (Bivalvia: Spondylidae) of the Panamic Province*. This special issue featured four color plates on the Panamic *Spondylus*. That same year a supplement, *An Atlas of Cowrie Radulae (Mollusca: Gastropoda: Cypraeoidea: Cypraeidae)*, by Hugh Bradner and E. Alison Kay was published. This 179-page supplement contained 238 figures of cowrie radulae, mostly

photomicrographs at high magnification.

The January 1998 Special Issue was the Anthony D'Attilio Memorial Issue and it consisted of a series of small articles by his friends and colleagues, a list of taxa proposed by him, a list of his published works, and photographs of the taxa named in his honor. In 1999 *The Festivus* published a revision of the 1984 supplement, *Illustration of the Types Named by S. Stillman Berry in His "Leaflets in Malacology."* The original had been in great demand and was out of print. The revised edition used the improved methods made possible by the computer and the improved quality of photo reproduction.

The use of color photography has become more common in the last few years and the goal is to have at least one color plate monthly. Starting with a washed out color plate in 1990, *The Festivus* has progressed to very vivid plates in our current issues. During the earlier years *The Festivus* utilized Digital Output for its color plates, a San Diego company that had leased a proprietary Israeli process. The plates would be printed separately and inserted into the monthly issues by our Instant Print company. Because of the expense of this procedure, *The Festivus* experimented with printing color photographs and hot bonding them into the issues. This was very time consuming and not a practical solution. Fortunately color printing has greatly improved and our current printer, Electronic Printing Solutions, does a very good job. The process is still expensive but considerably less than it was 10 years ago.

After 36 years of publication, *The Festivus* is a peer-reviewed "scientific journal" with a world-wide readership. Although the quality is greatly improved the basic problems remain the same. The primary concerns are getting sufficient articles, getting them reviewed and corrected in a timely fashion, and having enough funding to continue to upgrade the quality. It is the goal of *The Festivus* to continue publishing special issues and supplements that are of importance to our readers and the scientific community.

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## *TRAPANIA GODDARDI* (NUDIBRANCHIA: GONIODORIDIDAE): RANGE EXTENSION TO THE PACIFIC COAST OF THE BAJA CALIFORNIA PENINSULA (MÉXICO), WITH BIOGEOGRAPHICAL CONTEXT

HANS BERTSCH

Research Associate, Natural History Museum of Los Angeles County  
192 Imperial Beach Blvd. # A, Imperial Beach, CA 91932  
E-mail: hansmarvida@sbcglobal.net

Our understanding of the nudibranch fauna of the eastern Pacific has changed greatly since the publication of Behrens' 1981 summary of the then known 162 species and their distributions from Alaska to northern México. His most recent volume (Behrens & Hermosillo, 2005) covers the region from Alaska to Central America, and includes 314 species, of which 37 are unnamed. The majority of these unnamed species are from the southern portion of the coverage of this book. There are also a number of species that have been recorded from only a few specimens and from a very restricted area (e.g., *Jorunna pardus* Behrens & Henderson, 1981, and *Dendrodoris stohleri* Millen & Bertsch, 2005). Some species originally named from limited regions (e.g., *Chromodoris marislae* Bertsch, 1973, and *Tritonia pickensi* Marcus & Marcus, 1967) have had their ranges extended southward by studies in the states of Jalisco, Nayarit, Colima, Michoacán and Guerrero, México, undertaken by Alicia Hermosillo and her colleagues (see Hermosillo-González, 2003, Hermosillo & Behrens, 2005, and Hermosillo & Valdés, 2004).

A grant from CONABIO (the Mexican federal agency: Comisión Nacional para el Conocimiento y Aprovechamiento de la Biodiversidad) allowed Orso Angulo Campillo and me (1997–1998) to study the biodiversity of opisthobranchs at selected sites along the Baja California peninsula, and to survey the California museum collections of opisthobranchs from the Mexican eastern Pacific (including the Sea of Cortez). Part of our field work involved several extended subtidal and intertidal research expeditions to the Punta Eugenia region (Bahía Tortugas, and Islas Cedros and Natividad), Baja California Sur. Discussions of these findings, including significant

range extensions, have already been published in Bertsch, Angulo Campillo & Arreola, 2000; Bertsch, Angulo Campillo, Arreola, & Sánchez Ortiz, 2000; and Angulo Campillo & Bertsch, 2000. Electronic versions of the material deposited in the California museums (San Diego Natural History Museum, Natural History Museum of Los Angeles County, Santa Barbara Museum of Natural History, and California Academy of Sciences) are available from the author.

A recent revision of photographs from the field expeditions has led to the discovery of another important range extension for a species that had not been named while we were conducting our research.

*Trapania goddardi* Hermosillo & Valdés, 2004.

Original material and only known localities from Bahía de Banderas and Sayulita, Nayarit, México. "The body is off-white with irregular brown spots and large diamond markings on the sides of the body, and in the middle of the dorsum. It has one extra-rhinophoral appendage. The appendages, rhinophores, gill, and tail are off-white with brown spots....Size to 6 mm" (Behrens & Hermosillo, 2005: 54). The species is known in light and dark color forms.

On 26 February 1998, one specimen (Figure 1) was found at the low tide region in front of the PESCA camp at Bahía Tortugas (27° 41' 36" N; 114° 53' 14.8" W), Baja California Sur. The living animal measured 14 mm in total length. It should be noted that this specimen is of the "light" color variety.

This animal from Bahía Tortugas represents a northern range extension of over 1250 km (~ 750 miles) from its known sites of occurrence deep within the Panamic Province, and a new size record for the species. Biogeographically, Keen (1971) described the



Figure 1. *Trapania goddardi*, 14 mm living length, Bahía Tortugas, Baja California Sur, México.

Panamic Province as occurring from Bahía Magdalena (Baja California Sur, México) south to Perú. However, the northern limits of the province show ecotonal extensions to the region of Punta Eugenia which includes Bahía Tortugas (Bertsch, 1973, 1979, 1990). This species demonstrates such a distributional pattern.

Obvious external structural features immediately distinguish *Trapania goddardi* from other genera of eastern Pacific Goniadorididae. The three other species of *Trapania* from this region are *T. goslineri* Millen & Bertsch, 2000, *T. velox* (Cockerell, 1901), and *T. inbiotica* Camacho & Ortea, 2000. However, they all have yellow markings on their bodies, which are completely lacking in *T. goddardi*. The text of the original description of *T. goddardi* and comments about these species of *Trapania* can be found on the internet: <http://slugsite.us/bow/nudwk503.htm>.

The fact that three of the four species of *Trapania* have been named over 100 years since *T. velox* was first named indicates the increased study of nudibranchs in recent years, especially in the more southerly portions of the eastern Pacific.

I thank Dave Behrens and Ali Hermosillo for their comments and assistance.

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### UNDER THE ICE IN ANTARCTICA

Peter Brueggeman, Director of the library at Scripps  
Institution of Oceanography, will present an illustrated

program on his dives under the Antarctic ice and will show  
images of the mollusks and other invertebrates he found there.

Also

The Club's 2006 Science Fair winner, Ben Smith, an 8<sup>th</sup>  
grader at St. John's school, will present his winning

project, "Fossils of the Bay Point Formation" and receive his  
book award from the Club.

Meeting date: June 15, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting May 18, 2006

The meeting was called to order at 7:45 PM by Vice-President John LaGrange in the absence of President Bill Schneider. The minutes of the previous meeting were accepted as published in *The Festivus*. Visitors Dave and Vivian Waller were welcomed.

Treasurer Silvana Vollero reported that the Annual Auction was the biggest and most successful ever, and that most statements had been paid. The sum raised will assist in the publication of *The Festivus*.

Botanical Society representative, Wes Farmer, announced the Society's need for new member club representation before the City Council.

Librarian Marilyn Goldammer announced the receipt of Pisor's current *Registry of World Record Size Shells* for the Club library. It is now available for circulation.

Articles are always needed for *The Festivus*, according to Editor Carole Hertz.

Vice-President LaGrange introduced the evening's speaker, Tom Demere, curator of paleontology at the San Diego Natural History Museum, who spoke on Marine Fossils in the Imperial Desert Area. His findings on this subject have been included in a new book, *Fossil Treasures of the Anza-Borrego Desert*.

Tom's excellent slide program illustrated the dynamics of plate tectonics. Movement between the North American and Pacific plates, in the Late Miocene, affected the formation of the Imperial Sea, an embayment existing between present day mainland Mexico and Baja California, northwest to Riverside County in California. Illustrated were marine fossils now found in the Imperial Desert of California reflecting origin in the Tertiary Caribbean Province. This province existed before the Isthmus of Panama was formed, separating the Panamic and Caribbean Provinces. A question and answer session following the talk and slide show stimulated further discussion.

The evening's door prize was won by Marilyn Goldammer. The meeting was adjourned at 8:40 PM. Members enjoyed the social time and the cookies for the coffee hour that were provided by Ron Deems and George Kennedy.

Nancy Schneider

### The Greater San Diego Science and Engineering Fair - 2006

Ben Smith, an 8<sup>th</sup> grader at St. Johns School in Encinitas, entered the Fair in the Earth Sciences category. His project, *Fossils of the Bay Point Formation*, was the Club's winner and he has chosen as his Club book award, Barnes' *Invertebrate Zoology*. This is the first time the Club's judges have chosen a winner from the Junior Division.

Ben will attend the Club's June meeting to present an overview of his winning project and receive his Club book award and the congratulations of the membership.

### A Generous Gift to the Club

Thanks to the efforts of Jim Goldammer, the Club is now the owner of a PowerPoint projector. Jim became aware that *Pharmelle*, the company he works for, had a PowerPoint projector that was no longer being used. Because Jim thought of the Club and told them that the Club is a registered non-profit organization in need of such a projector, the company offered the projector to us. Our grateful appreciation goes to Jim for his efforts on the Club's behalf.

### Save the date!

### The September Party - 2006

Larry and Debbie Catarius have generously agreed to again host the Club's September Party. The date for the affair is Saturday, September 9<sup>th</sup>. Further information and map will be included in the August issue of *The Festivus*. Mark your calendars and save the date. It's always great fun.

### New Members

Morrison, Hugh, 5 Ealing Mews, Kingsley, 6026, Perth, Western Australia. E-mail: [hugh@seashells.net.au](mailto:hugh@seashells.net.au)  
Waller, David & Vivian 505 No. Willowspring Drive, Encinitas, CA 92024. Phone: 760-633-3006. E-mail: [dbwipmg@sbcglobal.net](mailto:dbwipmg@sbcglobal.net)

### New e-mail address

Weber, Gladys <[gladweber@inreach.com](mailto:gladweber@inreach.com)>

## A COMPARATIVE ANALYSIS OF *PAROCTOPUS DIGUETI* POPULATIONS IN THE GOLFO DE CALIFORNIA

KIRSTEN SELLHEIM<sup>1</sup>

University of Arizona, Department of Ecology and Evolutionary Biology  
Tucson, Arizona 85719, USA  
E-mail: kirsten82@gmail.com

**Abstract** This study compares sex ratio, evidence of nonlethal predation, and habitat choice of *Paroctopus digueti* populations in intertidal and subtidal areas of the Golfo de California, México. A total of 26 individuals were examined from intertidal sites of Bahía Cholla (31°N, 114°W) and Bahía San Felipe (30°N, 96°W) in the northern Golfo de California. Twenty-five individuals were examined from subtidal areas off two islets in Bahía Concepción (26°N, 112°W) in the central Gulf. Differences in sex ratio, shelter choice, damage to arms, and ratios of mature to immature animals were found between populations. A relationship was found between the size of the octopus's shelter and its body mass. This study provides information on octopus populations in several geographic areas that had not been studied previously. It poses questions concerning external factors, such as temperature, which may contribute to the onset of sexual maturation and growth in natural populations of octopus.

### Introduction

*Paroctopus digueti* (Perrier & Rochebrune, 1894) (Figures 6-9) is a small benthic octopod found throughout the Golfo de California (Hochberg, 1980; Roper, et al., 1995). The species was recently transferred to another genus (see Norman & Hochberg, 2005). The species typically inhabits empty gastropod shells and paired bivalve shells in sandy intertidal and subtidal areas. It feeds on small crustaceans and mollusks. Like most small octopus species, *P. digueti* has a short lifespan (around 6 months) in which females produce a single clutch of eggs (DeRusha et al., 1987). Studies have been conducted to assess the life history, distribution and habitat selection of the *P. digueti* population at Bahía Cholla, Sonora, México in the northern Golfo de California (Titley, 1982; Voight, 1983, 1990, 1992). Populations in areas further south in the Gulf have been sampled, but never formally studied.

The empty mollusk shells inhabited by *P. digueti* are the animal's primary means of protection against predators and provide a substrate for laying eggs. Therefore, choosing an adequate home is essential for the octopus's survival. A relationship between size of an octopus and shelter choice has been reported in previous

studies on *Enteroctopus dofleini* (Hartwick et al, 1984, 1988). The shelter must be large enough so that the animal's entire body will fit inside, but small enough for the animal to be able to adhere itself tightly to the interior. In an environment where an abundance of many shelter sizes are available, it is likely that *P. digueti* will be found in a shelter proportionate to its own body size.

Although *P. digueti* usually remains inside the safety of its shelter, it must venture out periodically to attain food and to mate. This exposes the animal to predation. In intertidal zones, such as the sand flats of Bahía Cholla and Bahía San Felipe, seabirds (eg. sea gulls, *Larus* spp.) are primary natural predators of octopus. In subtidal zones, such as the areas around the islets of Bahía Concepción, a diversity of fishes are major predators. In both areas, crabs (eg. the Pacific blue crab, *Callinectes arcuatus*) also prey on the octopus. *Paroctopus digueti* "tests the waters" outside its shell by probing the area around it with its arm tips (pers. obs). As a result, animals are often found with one or more missing arm tips or regenerating arms. This arm damage provides evidence of nonlethal predation.

Research has shown that water temperature can dramatically affect the rate of development and growth

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<sup>1</sup> 3161 Street #2, Davis California 95616, USA.

in several species of octopuses (Forsythe & Hanlon, 1988; Mangold, 1983; Mangold & Boletzky, 1973; DeRusha et al., 1987). In rearing studies, DeRusha et al. (1987) found that *P. digueti* eggs in 16°C seawater hatched 90 days later than eggs in a 25°C environment. Sea surface temperatures in the northern Golfo de California fluctuate dramatically, dropping to 11°C in the late winter and reaching up to 32°C during the late summer months (Figure 1). Temperatures in the central Gulf are comparatively stable, ranging from 16–27°C at any given time of year. In addition, water temperature stays warmer in the south during the winter months (Figure 1). The sudden conspicuous elevation in temperature in the north during early spring is not nearly as drastic in the south. It has been suggested that sudden rapid increases in temperature during the spring in the northern Golfo de California has caused synchronous hatching of *P. digueti* eggs spawned over several months (Voight, 1992). This synchronous hatching results in a large proportion of mature animals during the early summer months. However, it is not known whether this summer "cohort" of mature animals occurs in areas further south, where annual temperatures remain comparatively consistent across seasons.

This field study compares the average size, sex ratio, evidence of nonlethal predation, and habitat choice of *P. digueti* populations in two sites of the northern Golfo de California with populations in two sites further south. The study also tests for the presence of a summer cohort of mature animals in both northern and southern populations, using ratios of mature to immature animals. This information will help scientists to better understand the effects of climatic events such as El Niño, and predict the impact of temperature fluctuations on temperature-sensitive marine communities.

## Methods

### Study Sites

Four sites in the Golfo de California, México, two in the north and two in the south, were sampled in 2003 over a month-long period from early June to early July. Bahía Cholla, Sonora (31°N, 114°W) and Bahía San Felipe, Baja California (30°N, 96°W) were chosen as the northern sites. Two islets in Bahía Concepción, Baja California Sur (26°N, 112°W) were chosen as the southern sites.

Bahía Cholla and Bahía San Felipe were sampled from June 5–6 and July 11–12, respectively. Bahía Cholla is located near the town of Puerto Peñasco, Sonora. Bahía San Felipe is north of the town of San Felipe, Baja California. Both areas are wide,

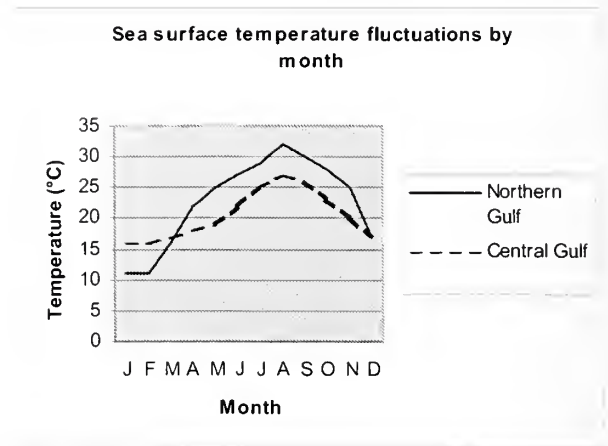


Figure 1. (from Voight 1983, Ripa and Marinone 1989). Yearly fluctuations in surface temperature for two areas in the Golfo de California. The first area, depicted by a solid line, represents change in temperature for Bahía Cholla, in the northern part of the Gulf. The second area, shown by a dashed line, represents temperature for the central Gulf. Temperatures increase sharply in the northern Gulf from February to May, and remain comparatively stable further south.

shallow, sandy bays on the northern banks of the Golfo de California. During low tide, vast stretches of these bays are exposed, leaving shallow channels of water filled with coarse sand and shell debris. Numerous scattered empty gastropod shells and paired bivalve shells provide potential shelters for octopus.

Two islets in the northern part of Bahía Concepción were sampled on July 8–11. Both islets are small (0.5 km across) and are located about 1–1.5 km from shore. Subtidal areas directly off the shores of these islets are shallow (2 m deep on average) over wide expanses, with coarse sand and shell debris. Paired and halved bivalve shells of several sizes are abundant around the islets.

### Sampling techniques

Three-hour walking or snorkeling transects were made in each area for four consecutive days. On these transects, empty gastropod and bivalve shells were checked for octopus. Shells were emptied of water, which in most cases induces the animal (except for brooding females) to evacuate (pers. obs). When an octopus was found, the inhabitant and its shelter were collected for examination, and were later released. Additionally, artificial shelters in the form of brown glass beer bottles were used to sample larger *P. digueti*. These shelters have been readily occupied in previous studies (Titley, 1982; Voight, 1983, 1990, 1992). Five bottles were spaced 1 m apart and attached to fishing



Site	Total octopus	No. males	No. females	No. immature	ML range (mm) Mean $\pm$ SE	MW range (mm) Mean $\pm$ SE	BM range (g) Mean $\pm$ SE
BC	14	6	6	2	3-50 mm 37.3 $\pm$ 13.0	2-37 mm 27.7 $\pm$ 9.8	2-32g 26.0 $\pm$ 10.6
BSF	12	4	2	6	14-44 mm 27.9 $\pm$ 9.4	11-31 mm 19.3 $\pm$ 6.0	2-36g 13.2 $\pm$ 10.9
Islet 1	10	0	1	9	11-34 mm 17.5 $\pm$ 6.9	8-28 mm 13.9 $\pm$ 6.0	2-28g 5.7 $\pm$ 8.1
Islet 2	15	0	1	14	10-26 mm 16.9 $\pm$ 4.9	7-17 mm 10.3 $\pm$ 3.2	2-13g 3.7 $\pm$ 3.1

Figure 2. *Paroctopus digueti*: Total numbers, sexes, mantle lengths, mantle widths and body masses across sites. Summarizes information by site, including the total number of animals, numbers of each sex, and range and mean mantle length (ML), mantle width (MW) and body mass (BM). The northern sites are Bahía Cholla (BC) and Bahía San Felipe (BSF) and the southern sites are Islet 1 and Islet 2.

line. Tent stakes were used to keep the lines in place. Three lines of shelters were staked in each area, spaced approximately 200 m apart. These shelters were placed in the areas where the walking or snorkeling transects were conducted during the low tide before the surveys began. The bottles were checked during each of the survey days. If an octopus was found, the bottle was removed from the line for examination and replaced with an empty bottle. Live octopus were examined shortly after collection. The animal was evacuated from its shelter by emptying the water and allowing it to crawl out into a plastic ladle that was attached to a hanging scale. The water was emptied from the ladle and the body mass (BM) was recorded. The octopus was then placed into a shallow pan, where mantle length and mantle width were measured with calipers and all arms were checked for damage. Sex was determined by presence or absence of a modified third right arm tip, or ligula, which is used by the male for depositing spermatophores. Octopus with a visible ligula were categorized as mature males. Octopus without visible ligula and with BM of less than 10 g were considered immature. Octopus without a ligula and with BM greater than 10 g were categorized as mature females. Because the animals were not examined internally, the determination of maturity was fairly subjective. However, in the interest of consistency, the words "mature" (males and females) and "immature" will thereafter be used in describing these size categories.

The animal was returned to its shelter and released near where it was captured. If the octopus was found in a shell, the shell was identified to genus. The shell was later categorized by inner shell volume. Five paired shells of each genus of bivalve were collected and inner

Shelter type	North	South
<i>Chione</i>	7	23
<i>Trachycardium</i>	2	2
<i>Choromytilus</i>	8	—
Other bivalves	2	—
<i>Polinices</i>	1	—
<i>Turritella</i>	1	—
Glass bottle	4	—

Figure 3. *Paroctopus digueti*: Shelter choice between sites lists all shelter types in which octopus were found. All octopus found in bivalves were found in whole shells. The types of shelters chosen at Bahía Cholla and Bahía San Felipe (North) are compared with those in Bahía Concepción (South). Note the high diversity of shelters in the north as compared with the south.

shell volume was obtained for each by filling the inner cavity with clay. The resulting piece of clay was formed into a cube and volume was calculated. The average of the five volumes was used in categorizing the size of each genus of shell. Based on these calculations, two size categories were made. "Small" shelters were defined as those with an inner shell volume of less than 20 cm<sup>3</sup>, and "large" shelters greater than 40 cm<sup>3</sup>. Because they were both visibly very small, the two gastropod shells *Polinices* and *Turritella* were placed in the "small" category.

Voucher specimens of some mature male and female and immature octopus were collected and preserved in 70% alcohol. They are archived in the cephalopod collections of the Department of Invertebrate Zoology at the Santa Barbara Museum of Natural History (SBMNH). Statistical analyses were conducted using a two-sided Z-test and T-test for significance.



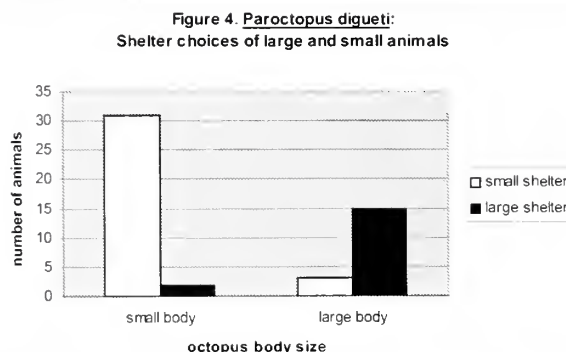


Figure 4: *Paroctopus digueti*: shelter choices of large and small animals. This figure represents the relationship between octopus body size and shelter size. "Large" octopus are those with a body mass (BM) greater than 13 g. "Small" octopus are those with a BM less than 13 g. "Large" shelters are those with an internal volume greater than 40 cm<sup>3</sup> (*Trachycardium*, *Choromytilus*, and glass bottles). "Small" shelters are those with an internal volume of less than 20 cm<sup>3</sup> (*Chione*, *Polinices*, and *Turritella*). Because internal shell volume was not determined for shells in the "other bivalves" category, they were not included in this chart.

## Results

A total of 51 *P. digueti* were examined. Of these, 26 were taken from the Bahía Cholla and Bahía San Felipe and 25 from Bahía Concepción. Octopus were found in *Chione*, *Choromytilus*, and *Trachycardium* bivalve shells and in *Turritella* and *Polinices* gastropod shells. Traplines were successful in capturing four octopus from the northern sites only. One animal was found live and washed up on an exposed sand flat. Mature males, mature females and immature animals were found at each of the sites. Mature male BMs ranged from 10-32 g, and mature female BMs ranged from 13-32 g. Mantle lengths ranged from 17-43 mm for mature males, and in mature females from 24-50 mm. Immature animals ranged in BM from less than 2 g to 9 g, with mantle lengths from less than 5 to 25 mm (see Figure 2 for information by site).

### Comparison of sexes

The male/female sex ratio of mature octopus in the northern sites is 10:8 (Figure 2). However, it should be noted that the sex of live immature animals was not determined. Because only two mature females and no males were collected from the south, sex ratio at these two sites could not be estimated.

Across sites, the average BM for mature males was 27 g (n = 10) and for mature females it was 25.8 g (n =

10). In the north, the average mature female BM was 27.1 g (n = 8). In the south, the average female BM was 20.5 g (n = 2). No mature males were captured in the southern site.

### Mature and Immature Animals

The ratio of mature to immature animals differed dramatically between northern and southern populations. The northern population had a mature to immature ratio of 19:7. The Bahía Concepción population had a ratio of 2:23 (Figure 2).

### Shelter choice

In almost all cases, octopus were found in shells that corresponded to their body size (Figure 4). Octopus were found in 5 genera of bivalve shells: *Chione*, *Trachycardium*, *Choromytilus*, and two unidentified bivalve genera. One animal was found in each of 2 genera of gastropods: *Polinices* and *Turritella*. Overall, the ratio of bivalve shelters to gastropod shelters is 44:2. Only northern sites yielded success with the artificial bottle shelters (Figure 3).

### Predation

Seventeen octopus in the north and 14 in the south were not missing any arms or arm tips. Five in the north and 6 in the south had one arm damaged. Two octopus at each site had 2 arms damaged, 4 octopus in the north had 3 or more arms damaged.

Comparing incidence of arm damage across sites by sex, 45% of all males (n = 10) and 20% of all females (n = 10) had arm damage (Figure 5). Of the males that had damaged arms, 4 out of 5 had two or more injuries. Both females with arm damage had only one injury. A total of 37% of all immature animals (n = 30) sustained arm damage. All but three had only one arm damaged (Figure 5).

Mature male and female octopus had more dorsal arms damaged than ventral arms (Figure 5). Only one male had its right third arm (ligula) damaged. Immatures had roughly equal dorsal and lateral arm damage (4:2 in the north and 5:5 in the south) (Figure 5).

## Discussion

### Comparison of sexes

The overall male/female sex ratio of mature octopus in the northern site was 3:2 (Figure 2). Octopus found in bottle traplines were not considered in calculating the sex ratio because in previous studies, a male biased sex ratio has been attributed to use of artificial shelters for

	No. animals with arm damage	Total damaged arms	Mean damaged arms per individual $\pm$ SE	Proportion of animals with damage Ratio of lateral:dorsal arms damaged		
				Male	Female	Immature
North	11	23	0.88 $\pm$ 1.33	0.50 (n = 10) 3:11	0.25 (n = 8) 1:3	0.50 (n = 8) 4:2
South	8	10	0.40 $\pm$ 0.65	--	0.0 (n = 2)	0.35 (n = 23) 5:5

Figure 5. *Paroctopus digueti*: Evidence of nonlethal predation. This table compares the number of animals with arm damage and the total number of arms damaged in northern sites (Bahía Cholla and Bahía San Felipe) with those in the southern sites (islets in Bahía Concepción). It also compares arm damage by sex and by maturity, and lateral versus dorsal arms.

sampling. Sexually mature male octopus tend to be more mobile than gravid females (Mangold, 1983). Only taking into account the animals found on transects, a slightly male-biased sex ratio was present in the north. However, because of the small sample size, the ratio was not statistically significant ( $p = 0.12$ , two-sided z-test). As has been found in most octopus populations, it is likely that the actual sex ratio was roughly 1:1.

There were only 2 mature octopus out of the 25 animals found at Bahía Concepción. Because of the small number of mature animals, and because the sex of immature animals was not determined, the measured male/female sex ratio (0:2) cannot be viewed as an accurate representation of the general population (Figure 2). Male and female body masses did not differ significantly between populations ( $p = 0.739$ ,  $df = 17$ , two sample t-test).

#### Mature and immature animals

The northern populations at Bahía Cholla and Bahía San Felipe were significantly biased towards mature individuals ( $p = 0.05$ , two-sided z-test) (Fig. 2). This bias is indicative of the adult cohort described by Voight (1992). However, the number of immature animals found at these sites indicates that the cohort is not discrete, and that hatching occurs at different times throughout the months of spring.

The southern site's population is significantly biased towards immature animals (23:2 ( $p < 0.001$ , two-sided z-test)) (Figure 2). Due to the rarity of mature animals in the southern site, it appears as though a nearly discrete cohort of small immature animals was present in this population. The comparatively constant temperatures at Bahía Concepción indicate that there must be some explanation other than temperature fluctuation for the conspicuous presence of this assemblage of immature animals.

Laboratory studies that varied food intake found that decreasing consumption also decreased the rate of growth for some octopus species (De Rusha et al., 1987; Mangold & Boletzky, 1973; Mangold, 1983). It is possible that seasonal changes in *P. digueti*'s prey populations in either site may affect growth and maturation. Nutrient concentrations and oxygen levels in seawater could also affect growth and development. In the subtidal sites, oxygen concentrations are likely to remain more constant than in the intertidal regions, which may fluctuate with waxing and waning of the tide (Hochberg, pers. comm.). Another possibility that may explain differences in maturity between populations is that higher levels of predation have caused changes in the energy budgets of *P. digueti* in the northern populations. Energy required for arm regeneration could cause a slowing of growth and reproductive development for immature animals that have lost one or more arms or arm tips. This could account for the more even ratio of mature to immature octopus in the north.

#### Shelter choice

In the north, shells chosen as shelters were diverse. *Chione* and *Choromytilus* shells were most commonly chosen shelters, but animals were also found in *Trachycardium* and two other unidentified bivalve genera (Figure 3). Two immature animals were discovered in *Polinices* and *Turritella* gastropod shells. The southern population, in contrast, inhabited only *Chione* and *Trachycardium* bivalves (Figure 3). This was probably due to the comparatively lower diversity in available shelters. In the south, *Chione* was by far the most abundant of all shell taxa present (pers. obs.).

Only northern sites yielded success with the artificial bottle shelters. The body masses of animals found in the bottles (22-32 g) were among the highest of all animals examined. Based upon the high proportion of

immature animals found on the transect surveys, the lack of success with the bottle traps at the southern sites was to be expected. Voight (1992) found that bottle traps captured mainly large mature octopus. The tendency for large octopus to occupy artificial homes can probably be explained by limitations in the number of natural shelters available that have an adequate internal volume to accommodate them.

Shelter choice by *Paroctopus digueti* appears to be primarily a function of body size. Shells of many sizes were abundantly available at both sites. Small octopus were almost exclusively found in shells with an internal volume of less than 20 cm<sup>3</sup>, whereas larger octopus were generally found in shells with internal volume greater than 40 cm<sup>3</sup> ( $p < 0.001$ , two-sided z-test) (Figure 4).

The relationship between body size and shelter choice has been reported in previous studies on *Euteroctopus dofleini* (Hartwick et al., 1984, 1988). A shelter proportionate to its own body size provides the octopus more control over the amount of protection the shell provides, especially in the case of bivalves. A small octopus is much more easily extracted from a large bivalve shell, such as a *Trachycardium* or *Choromytilus*, than from a small shell, such as a *Chione* (pers. obs.). As the octopus grows larger, it becomes stronger and has more suckers and greater sucker surface area. It is better able to protect itself within a large, heavier shell.

*P. digueti* appears to have a significant inclination towards bivalve shells at all sites (north  $p < 0.01$ , south  $p < 0.001$ , two-sided z-test), as shown in Figure 3. There were more bivalve shells than gastropod shells in the southern site. However, even in the north, where the proportion was about even, bivalves were utilized as homes more frequently. Octopus may be better able to defend themselves in bivalves, which offer protection from all sides when the shell is closed. Gastropod shells, on the other hand, have a more fixed shape and an aperture that leaves the octopus susceptible to predation.

#### Predation

Males incurred slightly more arm damage than females ( $p = 0.168$ ,  $df = 14$ , two-sample t-test). This may be attributed to the higher mobility of mature males as described by Mangold (1983). The proportion of animals with arm damage did not differ significantly between sites ( $p = 0.455$ , two-sided z-test) (Figure 5). However, total number of arms damaged in the north was 2.3 times the number of those in the south (Figure 5), and the number of arms damaged per individual in

the northern site was slightly higher than in the south ( $p = 0.056$ ,  $df = 24$ , two-sample t-test). A higher percentage of immature animals could contribute to the lower number of arms damaged per individual in the Bahía Concepción population. Mature males incurred slightly heavier arm damage than immature animals on average ( $p = 0.191$ ,  $df = 10$ , two-sample t-test). Assuming that arm and arm tip loss causes scarring or evidence of regeneration, it is expected that younger animals would have less arm damage because they have had less time to be preyed upon. It is also possible that immature animals have greater regeneration abilities than animals that are mature, as has been found in the cuttlefish *Sepia officinalis* (Feral, 1978). Unfortunately, neither tissue regeneration rates nor a reliable mechanism for determining approximate age are currently available for *P. digueti* or any other octopus species.

Mature males had more dorsal arms than ventral arms damaged, by a ratio of 11:3. This is to be expected, since animals probably use the dorsal arms more often when exploring the area outside their shell. Additionally, one would expect that the males would protect their right third arm (ligula). Indeed, only one male was found with damage to this arm.

Differences in predators between the northern and southern populations could help to explain the differences in total numbers of arms damaged (Figure 5). The sand flat populations of the northern Gulf are exposed to predation by birds for several hours every day during the low tide. In contrast, the members of the southern population are living in a subtidal zone, where the average depth is around 2 m. This barrier of water protects the animals from predation from birds, while opening them up to increased risk of predation from fishes and crabs. Analyses of gut content in potential predators, as well as a systematic analysis of predator population density for each site would help to explain sources of arm damage and loss.

Future field studies could monitor changes in populations of both the prey and predators of *P. digueti* across seasons and areas. Laboratory studies could provide a more controlled environment in which to study the effects of nutrient and oxygen levels, water temperature and food intake of *P. digueti* on its growth and maturation rate. In addition, arm regeneration studies could be conducted in a laboratory setting to determine the energy requirements of regenerating lost arms and arm tips, and whether arm damage affects the overall growth and development of the animal.



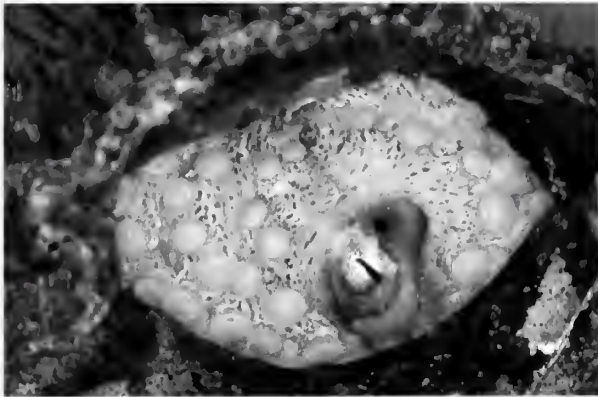


Figure 6. *Paroctopus digueti* inside its mollusk shell shelter. Photo: F.G. Hochberg.



Figure 7. *Paroctopus digueti* changing skin color pattern and texture to match sandy substrate. Photo: F.G. Hochberg.



Figure 8. *Paroctopus digueti* creating a mottled pattern to blend in with shell fragments. Photo: F.G. Hochberg.

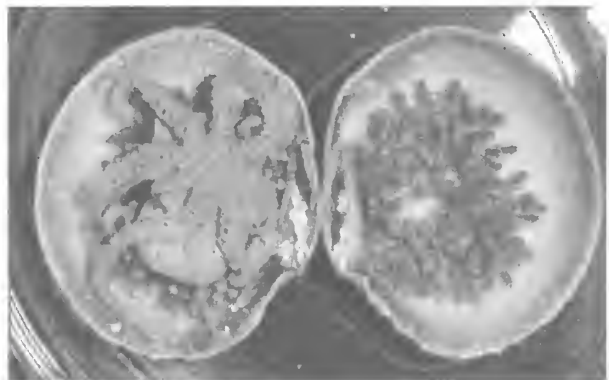


Figure 9. *Paroctopus digueti* specimen with eggs in a bivalve shell. Photo: F.G. Hochberg.

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## ANOTHER SHELLING TRIP – 1968

BILLEE GERRODETTE<sup>1</sup>

939 Coast Blvd. #15H, La Jolla, California 92037, USA

Our travel agent was always looking for new and interesting places for my sister Twila and me to go SCUBA diving or snorkeling. She told us there was a new airport at Truk in the Caroline Islands and that we could be on the first jet to land there. She told us that if we wanted to go to the island of Ponape we could go to Truk which was further and costs more, but we'd only have to pay for Ponape. Friends of ours knew a couple on a round-the-world yacht trip who were in the Caroline Islands area and suggested we meet them in Ponape. With some radio contact they invited us to join them. We asked what supplies they needed, got them together and off we went.

When we arrived in Truk, our diving bag was not unloaded. We could get along without clothes, but needed dive gear. I physically stood in front of the big jet ;and insisted they find our bag. Still no luck. As this was the first jet to arrive at the new airport and before tourists were flocking there to dive on the wrecks of the Japanese ships and planes, there was no hotel – just a dormitory for men.

The housing commission did not feel we belonged there so we were housed with a doctor and his wife in a triple quonset hut. The center of the quonset was living room, kitchen and bath. The doctor and his wife had one part of the quonset and my sister and I had the other that had been divided into two bedrooms. There was only one problem with the division. My sister had the light switch and I had the light. We were told if we wanted a hot shower in the morning not to flush the toilet first as the hot water was connected to the toilet!! It was such warm weather a cold shower felt great.

For our two days at Truk waiting for the old Flying Goose to take us east to Ponape, we had to find equipment for snorkeling. We finally found two small dive masks but no fins. Oh, well. We could manage. Then we needed protective covering. In a large hut there

was used clothing for sale. We felt they were probably donated by some church for the poor natives. We found mens shirts and bought one each. Then we went to the mens' pants area for jeans. The native women were having such fun watching us try on pants. They never wore pants.

On our second day we tried a couple of spots for shelling. To get around the island you would flag down any car or truck going in your direction and give them one dollar to take you where you wanted to go. On the third day, at the airport while waiting to leave for Ponape – low and behold they had unloaded our dive bag!

At Ponape, the Flying Goose flew over the bay to make sure nothing big was in the water and landed near a small island. A motor launch arrived to take us into the town. There was one small hotel. The season was just before Christmas and no supply ship had arrived. The island was out of sugar, butter and many other supplies needed for making holiday sweets.

Near one end of the island was a place called Nanbatal. It was a small ancient settlement with stone waterways throughout. There was no native memory of who had built it or when. We were warned that whenever people visited there it rained– and it rained this time but it was still an interesting place. The shelling we experienced around the area proved very good.

The new friends with the yacht invited us to join them in a trip to Ant Island. We were told the king of the island spoke some English. As predicted, in Ponape there were dolphins escorting us though the pass and into the lagoon. We called on the king who gave us some fresh coconuts to drink and told us we were the second yacht to ever visit there. We spent lazy days diving in the shallow lagoon.

One day my sister and I were diving at the entrance channel. I had gone into the channel to look over a gorgonian coral for a special shell and when I surfaced

---

<sup>1</sup> Written just after the 1968 trip.

Twila said, "Get over the reef." I was instantly on top of the reef and she pointed into the water. A large shark had been circling closer and closer to me. In our 43 years of diving it was the only time either of us felt threatened by a shark. With all day snorkeling we fell into dreamland early.

Twila and I slept in sleeping bags on the benches of the cockpit. We were awakened around midnight by a terrible noise surrounding our boat. It was several native canoes with the natives pounding on metal and saying, "Appy New Year." They also brought us hot cooked coconut crabs from the king. It was the sweetest meat we had ever tasted.

When we finally came to the end of our Ponape vacation we were taken out to the island to wait for the Flying Goose to pick us up. We had an hour to wait for the plane so Twila and I asked if we could swim

for awhile. The shelling was excellent and I found one of my prettiest shells just as the Flying Goose landed – a *Conus marmoreus* with the largest markings I had ever seen. We were a bit wet when we boarded the plane.

Back at Truk we were given a whole house to ourselves. After yacht food and hotel food we went to the market and looked longingly at lovely cucumbers – one of our favorite foods. So we bought five pounds of sugar, a pound of salt and a quart of vinegar in order for us to make cucumbers and vinegar. But the taste made it worth it!

We did not have enough alcohol to clean our shells properly so we bought a metal 5-gallon tin with a tight lid and put the shells there. Returning through Customs, we were asked what was in the can. We said, "smelly sea shells." Customs did not even open it.

It is fun to go places before the tourists ruin them.

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# THE FESTIVUS

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### UNDER THE ICE IN ANTARCTICA

As the result of an unfortunate "glitch," the June program did not happen. However, Peter Brueggeman, Director of the library at Scripps Institution of Oceanography, has kindly

consented to present, this month, his illustrated program on his dives under the Antarctic ice and will show images of the mollusks and other invertebrates he found there.

Meeting date: July 20, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting June 15, 2006

The meeting was called to order by President Bill Schneider at 7:50 p.m. The minutes from the May meeting, as published in *The Festivus*, were approved. The Treasurer reported a state of solvency for the club. The Vice-President is seeking a speaker for next month's meeting. A sign-up for the September Party was sent around. Jules Hertz reported that everything is set for the Christmas Party, and that unlike last year, this year an individual's uneaten food may be taken home.

Vice-President John LaGrange is trying to set up a field trip for the purpose of surveying and taking a census of mollusks present at Batiquitos Lagoon. Interest was exhibited by the membership present. Penasquitos and San Dieguito Lagoons are other possible localities to be surveyed. Kelvin Barwick announced an upcoming SCAMIT meeting to be held on September 11<sup>th</sup> in Santa Barbara. Newest member, David Waller, won the evening's shell door prizes.

Science Fair Judge John LaGrange introduced the winner of the San Diego Shell Club's San Diego Science Fair award. A junior Science Fair participant, Eighth Grader Ben Smith, presented his award-winning project, "A comparison of the Upper Pleistocene Bay Point Formation exposures at Torrey Pines Beach and Sunset Cliffs." Random tossings of a hoop in three places set the collection sites which produced his samplings and he made three visits to each locale. The environments surveyed were open beach vs. tide pools with rocky areas. Ben was awarded the book of his choice, Barnes' *Invertebrate Zoology* which was inscribed by the Club.

The meeting adjourned at 8:30 p.m. Kelvin Barwick provided cookies for the coffee hour which followed.

Nancy Schneider

### The September SCAMIT Meeting, Save the Date

The September SCAMIT meeting will be hosted by the Santa Barbara Museum of Natural History on Saturday September 11<sup>th</sup>. The main topic will be Nuculanidae. Visitors are welcome to this always enjoyable and free meeting. Details will follow.

### Change of E-mail Address

Skoglund, Carol. <carolskoglund@cox.net

### 2,400 Years of Malacology, Third Edition

"We are pleased to announce the posting, on the website of the American Malacological Society, of the Third Edition of the following publication: Eugene V. Coan, Alan R. Kabat & Richard E. Petit (2006), "2,400 Years of Malacology," online at: <http://www.malacological.org/publications/epubs.html>

This publication of 664 pages is a comprehensive catalog of biographical and bibliographical papers on malacologists, conchologists, paleontologists, and others with an interest in mollusks. This publication also provides links to online digitized works in systematic malacology.

Since the posting of the first edition (June 2004), and the second edition (January 2005), we have received comments and additions from a number of colleagues - for which we are most grateful - and we have continued our own searching through the literature.

The Third Edition has more complete coverage of paleontologists, largely from Cleavelly (1983) and Lambrecht, et al. (1938), as well as more extensive coverage of the nineteenth-century explorers and naturalists in Central and South America. Also, an increasing number of important historical and reference works are being digitized and made available online, such as the entire set of the "Challenger" Expedition volumes, the "Systema Naturae" of Linnaeus (1758) (and many other works available online through "Animalbase" and "Gallica"), Neave's "Nomenclator Zoologicus," and Sherborn's "Index Animalium." These digitization projects are invaluable in making rare publications more readily accessible.

We have also continued to pursue those individuals whose contributions to malacology are assuredly less well known than their contributions to other fields. Among the new entries is Hans Christian Andersen, the well-known Danish author of children's stories, who turns out to have been an avid collector of land and fresh-water mollusks.

As before, this catalog is a work in progress, and we plan to continue posting updated versions on a periodic basis. We encourage readers to explore and use this catalog, and we look forward to receiving your comments, and citations to new or overlooked papers."

Gene Coan, Alan Kabat, & Richard Petit

## NEW RECORDS OF OPISTHOBRANCH MOLLUSKS FROM THE GUAYAQUIL MARINE ECOREGION: NORTHERN PERÚ

KATIA NAKAMURA

Sta Sabina 267, Lima I, Perú  
E-mail: katia.nakamura@gmail.com

**Abstract:** Four new records of opisthobranchs are reported for the Northern Peruvian Coast, part of the Guayaquil Marine Ecoregion. An extension of the distributional range for four other species is also given. The species found belong to the Chromodorididae, Dendrodorididae, Flabellinidae and Tergipedidae families. The study was conducted through August 2005, at four different localities in the Tumbes and Piura regions, in Northern Perú. Locality data, size, morphological and radular descriptions are given.

### Introduction

The Guayaquil Marine Ecoregion extends from the Caraquez Bay (0°), Ecuador, to the Illescas Peninsula (6° S) in Perú (Sullivan Sealey & Bustamante, 1999). The northern Peruvian Marine Coast, due to its location and geographic characteristics, presents unique oceanographic features. Tropical waters from the Equatorial Pacific Current, move southwards with a sea surface temperature fluctuating between 22 and 27° C. Subtropical waters from the Peruvian Coastal Current, coming from the south, have a sea surface temperature ranging from 17 to 22° C (Terán et al., 2004). Both currents merge around 4° and 1°S creating a transitional zone that has exceptionally marked differences in temperature, salinity and nutrients compared to either current individually. Depending on the season of the year the oceanographic characteristics at 4° will be noticeably influenced by the tropical or subtropical waters. The principal upwelling site in the Northern Peruvian Coast takes place between 4° and 6°S, (Map 1) with a higher intensity measurable from July to December (Terán et al., 2004).

In 1999, Paredes et al. reported 1017 species of marine mollusks for Perú, with 570 species of marine gastropods, most of them (571 species of mollusks) reported for the Panamic Province. Paredes et al. (1999) stated, regarding the lack of information on aquatic mollusks, that it was necessary to intensify inventorial work along the Peruvian coast. Gosliner (1991) also noted that the state of knowledge about the distribution

of opisthobranchs along the Pacific South American Coast was practically nonexistent; and that further research will most likely report new species and present new records for the still unknown Peruvian coast (Schrödl, 2003).

There are about 6000 described species of opisthobranchs worldwide (Camacho-García et al., 2005). Since 1835, 12 scientific studies on the Peruvian Coast that included data on opisthobranchs have been published (Table 1), reporting a total of 42 benthic species distributed in 5 orders, 22 families and 30 genera. Eleven of these species were reported for northern Perú (Tumbes and Piura regions) (Map 1). Because of the sparse research carried out on the subject, the taxonomic placement of some species has not yet been updated.

The aim of this report is to increase the knowledge of the opisthobranch fauna along the Peruvian Coast, based on research trips and an extensive review of the available literature on Opisthobranchia.

### Materials and Methods

#### Field Collection

The study was conducted in northern Perú, within the Guayaquil Marine Ecoregion. Specimen collection was carried out by the author in August 2005 at four sites: Cancas (3° 94' S, 80° 93' W), Punta Sal (3° 97' S, 80° 97' W), Máncora (4° 23' S, 81° 12' W) and Pocitas (3 km. south from Máncora). Shore excursions and scuba dives were done at each location. The areas surveyed were the rocky shores throughout the intertidal zone between Punta Sal and Pocitas; and sandy-rocky bottom, 3 to 8 m depth at Cancas (Map 1). Opisthobranchs were found on rocks, among the algae,

coral and sponges. Specimens were preserved in 70% alcohol, after being narcotized in magnesium chloride (10%).

Observations on the external morphology of collected specimens were done in a small aquarium. Digital photographs were taken with a Pentax Optio 750Z during the daytime, using natural light to record all observations. Description of coloration, patterns and structural forms were recorded. Scanning electron microscopy photographs (SEM) were taken to make descriptions of the teeth and radular formula. Dissection and SEM photography were performed at the Natural History Museum of Los Angeles County.

Sea surface temperatures (SST) were obtained from the Peruvian Sea Institute (Instituto del Mar del Perú - IMARPE) web page ([www.imarpe.gob.pe](http://www.imarpe.gob.pe)).

#### Literature Research

An extended search for literature including data on opisthobranch mollusks from Peruvian waters found that since 1835 12 publications were available (Table 1). Information about the species found and their distribution along the Peruvian coast was compiled in order to create a base list to work upon (List 1).

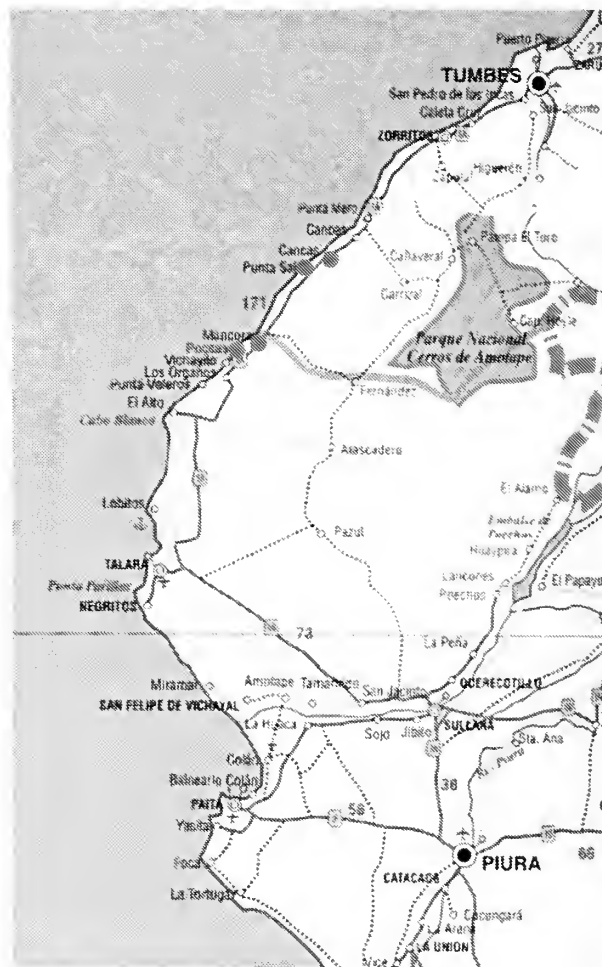
#### Results

In August 2005, three dives and three shore excursions were made, searching for opisthobranchs. A total of 35 specimens were collected, for which eight different species were identified (Table 2). Four new records were found within the surveyed area; one of them, potentially a new species (Nakamura, in prep.). The other four species were never reported before for the northern area. Taxonomic placement, geographic distribution, and collected material descriptions are given in detail for each species record. Sea surface temperature (SST) ranged from 21 to 22°C (Map 2) during the study period.

Order Nudibranchia  
Suborder Doridina  
Superfamily Anadoridacea  
Family Chromodorididae

*Glossodoris baumanni* (Bertsch, 1970)  
(Figure 1A-D)

Distribution: Golfo de California to Islas Galápagos (Camacho-García, Gosliner & Valdés, 2005) and Cancas, Perú (present study).



Map 1. Tumbes-Piura, Northern Perú  
Available from <[www.vivamancora.com](http://www.vivamancora.com)>

Each surveyed areas is marked with a black dot on the map.

- Cancas, Tumbes (3° 94' S; 80° 93' W).
- Balneario de Punta Sal, Tumbes (3° 97' S; 80° 97' W).
- Mancora, Piura (4° 23' S; 81° 12' W)
- Pocitas, Piura (3 km. south of Mancora)

Material: 3 specimens, 5-7 m depth at Cancas, 7 August 2005; 1 specimen, 8 m depth at Cancas, 8 August 2005.

Size: 25-30 mm in length.

External morphology: White oval body with red dots all over the mantle and some orange dots. An orange line may be present at the margin of the notum, if not, an orange foot-band and an orange line at the under side of the mantle. Perfoliate rhinophores. Gill with 9-13 unipinnate branchial leaves. Rhinophores and branchial leaves have white coloration with a red subterminal ring (Figure 1A).



Radular formula: 50 x 41.1.1.1.41

Radula: Vestigial rachidian teeth were present in one specimen. The lateral teeth have a central cusp and one lateral denticle at each side. The innermost marginal teeth have 4 lateral denticles at both sides of a big central cuspid. Up to 9 lateral denticles were found, increasing in number towards the outer side of the radula. At the outermost teeth, the central cusp and lateral denticles have the same size (Figures 1B and 1C).

Superfamily Eudoridacea  
Family Dendrodorididae

*Doriopsilla janaina* Marcus & Marcus, 1967  
(Figure 2A)

Distribution: Golfo de California, Punta Lobos, Sonora, México, off Pacific Coast of Panamá (Marcus & Marcus, 1967); Islas Galápagos (Gosliner, 1991) to Cancas, Perú (present study).

Material: 4 specimens, 3 m depth at Cancas, 8 August 2005.

Size: 20-35 mm in length.

External morphology: Oval body. Translucent light orange background mantle with brown and white patches all over the notum. The mantle is covered with small white and brown spots and presents white or brown tubercles with red tips. Perfoliate rhinophores, orange colored with white tip. Tripinnate branchial leaves, white with an orange marginal line (Figure 2A).

Suborder Aeolidioidea  
Superfamily Euaeolidiacea  
Family Flabellinidae

*Flabellina cynara* (Marcus & Marcus, 1967)  
(Figure 3A-E)

Distribution: From Puerto Peñasco, México to Panamá (Hermosillo, 2004) and Cancas, Punta Sal and Máncora, Perú (present study).

Material: 4 specimens, intertidal zone at Máncora, 6 August 2005; 5 specimens, 5 to 7 m depth at Cancas, 7 August 2005; 1 specimen, 3 m depth at Cancas, 8 August 2005; 1 specimen, intertidal zone at Punta Sal, 9 August 2005.

Natural History: Very common in all studied areas, ranging from the intertidal zone to around 8 m depth.

Size: 9 to 16 mm in length.

External morphology: Narrow and elongate body, deep pink or light salmon-pink, with or without white spots. Specimens present a fine purple line at both sides of the body. The pink cerata are thin and long, with a subterminal purple ring and a white tip. The digestive tube is red and can be seen along the cerata. Annulate rhinophores are half pink and half white; with a subterminal purple ring. Oral tentacles are longer than cerata but have their same color pattern (Figure 3A).

Radular formula: 12 x 1.1.1 (Figure 3B)

Radula: Narrow radula with 3 teeth per row (Figure 3B).

Rachidian teeth have a central pointed cusp on the upper side; with 8 to 10 lateral denticles at both sides. Lateral teeth are narrow and have 10 lateral denticles on the inner side and a light roughness on the outer side indicating new denticle formation; with a principal cuspid (Figure 3C).

Jaw: The masticatory border at the inner side is shown (Figure 3D). One of the specimens shows up to 5 rows of tubercle-like, not very pointed, masticatory teeth (Figure 3E).

Family Tergipedidae

*Cuthona* sp.  
(Figure 4A-B)

Distribution: Cancas, Perú (present study).

Material: 1 specimen, 5 to 7 m depth at Cancas, 7 August 2005.

Size: 5 mm in length.

External morphology: The body is completely white, including the plain rhinophores and the oral tentacles which have a translucent base. The cerata are dark reddish-brown without the white tip which makes it different from other *Cuthona* species (Figure 4A).

Radula: The radula could not be photographed because of difficulties mounting samples. Only a tooth could be rescued (Figure 4B). It was horseshoe-shaped with a central cuspid and 7 lateral denticles (2 were broken).

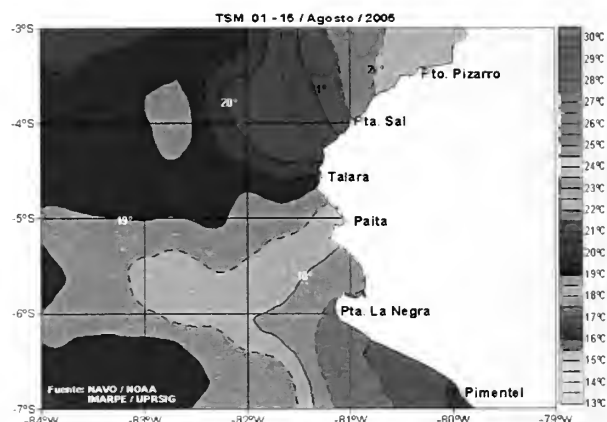
## Discussion and Conclusions

Eight species of opisthobranchs were collected at northern Perú; the first four shown in Table 2 are distributional extensions for Perú and the second four are reported here as new records for Peruvian waters. A total of 35 specimens were sampled during this trip;



20 (60%) are new records. Two new families (Dendrodorididae and Tergipedidae) and three genera (*Glossodoris*, *Doriopsilla* and *Cuthona*) were added to the Peruvian Opisthobranchia (List 1). Forty-six benthic species of Opisthobranchia are presently known in Perú; 19 of them have been reported for the northern area, meaning that 40 % of the opisthobranchs in Perú are reported to be found in the potentially most diverse area.

This study was restricted to three dives and three shore excursions. Despite the limitations of such a short study with a reduced number of collectors, new records were found. This underlines the lack of data available on Opisthobranchia from the northern Perú region and the potential for further research and potentially new records.



Map 2.- Sea Surface Temperature (SST).

From: <www.imarpe.gob.pe>

**List 1.** List of species and distribution of benthic Opisthobranchia (Mollusca: Gastropoda) from Perú

- |  |   |
|--|---|
| <p>Phylum Mollusca<br/>Class Gastropoda<br/>SubClass Opisthobranchia<br/>Order Cephalaspidea<br/>Superfamily Acteonoidea<br/>Family Acteonoidea</p> <p><i>Acteon traskii</i> Stearns, 1897<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>        <u>Piura</u>: Paita (Álamo &amp; Valdivieso, 1987)</p> <p><i>Acteon venustus</i> (d'Orbigny, 1840)<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>    <u>Piura</u>: Paita (Dall, 1909; Keen, 1971; Álamo &amp; Valdivieso, 1987)</p> <p>        Superfamily Philinoidea<br/>        Family Scaphandridae</p> <p><i>Acteocina angustior</i> Baker &amp; Hanna, 1927<br/>    <u>Perú</u> (Paredes et al., 1999)</p> <p><i>Scaphander cylindrellus</i> Dall, 1908<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>    <u>Tumbes</u>: Caleta Mero (Álamo &amp; Valdivieso, 1987)<br/>    <u>Callao</u> (Keen, 1971; Álamo &amp; Valdivieso, 1987)</p> <p>        Family Aglajidae</p> <p><i>Navanax aenigmaticus</i> (Bergh, 1893)<br/>    <u>Perú</u> (Gosliner, 1980; Paredes et al., 1999)</p> <p>        Superfamily Bullacea<br/>        Family Bullidae</p> <p><i>Bulla (Bulla) punctulata</i> A. Adams, 1850<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>    <u>Tumbes</u>: Puerto Pizarro (Peña, 1970; Álamo &amp; Valdivieso, 1987), Punta Malpelo (Álamo &amp; Valdivieso, 1987)</p> | <p>    <u>Piura</u>: Máncora, Paita (Peña, 1970; Álamo &amp; Valdivieso, 1987)</p> <p>    <u>Lambayeque</u>: Isla Lobos (Dall, 1909*; Álamo &amp; Valdivieso, 1987)</p> <p>    <u>Ancash</u>: Muelle Promar (Álamo &amp; Valdivieso, 1987)</p> <p>* Cited as <i>Bullaria punctulata</i></p> <p><i>Bulla aspersa</i> (A. Adams, 1850)<br/>    <u>Piura</u>: Paita (Dall, 1909)*</p> <p>*Cited as <i>Bullaria aspersa</i></p> <p><i>Bulla striata</i> (Bruguere, 1792)<br/>    <u>Piura</u>: Paita (d'Orbigny, 1836-45)</p> <p>        Superfamily Haminoeidea<br/>        Family Haminoeidae</p> <p><i>Haminoea peruviana</i> (d'Orbigny, 1842)*<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>    <u>Callao</u> (d'Orbigny, 1835-46°; Dall, 1909; Álamo &amp; Valdivieso, 1987°)</p> <p>*Cited with 1837 as the description year in Dall, 1909; and as 1813 in Paredes et. al, 1999.</p> <p>°Cited as <i>Bulla peruviana</i></p> <p>        Order Sacoglossa<br/>        Family Juliidae<br/>        Subfamily Juliinae</p> <p><i>Julia thecaphora</i> (Carpenter, 1857)<br/>    <u>Perú</u> (Paredes et al., 1999)<br/>    <u>Tumbes</u> (Álamo &amp; Valdivieso, 1987)</p> <p>        Superfamily Oxynoeidea<br/>        Family Elysiidae</p> <p><i>Elysia diomedea</i> (Bergh, 1894)<br/>    <u>Perú</u> (Paredes et al., 1999) *<br/>    <u>Piura</u>: Máncora (present study)</p> |
|--|---|

\*Cited as *Tridachiella diomedea*

*Elysia hedgpethi* Er. Marcus, 1961

Perú (Paredes et al., 1999)

Order Anaspidea

Superfamily Aplysioidea

Family Aplysiidae

*Aplysia chierchiana* (Mazzarelli & Zucard, 1889)

Callao: Isla San Lorenzo (Álamo & Valdivieso, 1987)

*Aplysia (Varria) dactylomela* Rang, 1828

Perú (Paredes et al., 1999)

*Aplysia (Varria) inca* Orbigny, 1837

Perú (Paredes et al., 1999)

Lima (d'Orbigny, 1835-46)

Callao (d'Orbigny, 1835-46; Dall, 1909\*; Álamo & Valdivieso, 1987): Isla San Lorenzo (d'Orbigny, 1835-46)\*

\*Cited as *Tethys inca*

*Aplysia (Aplysia) juliana* Quoy & Gaimard, 1832

Perú (Keen, 1971; Paredes et al., 1999)

Piura: Paita (d'Orbigny, 1835-46\*; Dall, 1909\*; Álamo & Valdivieso, 1987)

\*Cited as *Aplysia rangiana*

° Cited as *Thetys rangiana*

*Aplysia (Varria) keraudreni* Rang, 1828

Perú (Paredes et al., 1999)

*Aplysia lessoni* Rang, 1828

Piura: Paita (Dall, 1909\*; Álamo & Valdivieso, 1987)

\*Cited as *Tethys lessoni*

*Aplysia nigra* d'Orbigny, 1837

Perú (Paredes et al., 1999)

Callao (Dall, 1909\*; Álamo & Valdivieso, 1987): Isla San Lorenzo (d'Orbigny, 1835-46)

\* Cited as *Tethys nigra*

*Aplysia (Pruvotaplysia) parvula* Mörch, 1863

Perú (Paredes et al., 1999)

Subfamily Dolabriferinae

*Dolabrifera dolabrifera* (Cuvier, 1817)

Perú (Paredes et al., 1999\*)

Tumbes: Punta Sal (present study)

\* Cited as *Dolabrifera nicaraguana*

Order Notaspidea

Superfamily Umbraculacea

Family Umbraculidae

*Umbraculum umbraculum* (Lightfoot, 1786)

Perú (Paredes et al., 1999°)

Tumbes: Puerto Pizarro (Peña, 1970#; Álamo & Valdivieso, 1987\*)

#Cited as *Umbraculum ovael* which must be considered a typing error, the correct form being *ovale*

\*Cited as *Umbraculum ovale*

°Cited as *U. ovale* and *U. umbraculum*

Order Nudibranchia

Suborder Doridina

Superfamily Anadoridacea

Family Okeniidae

*Okenia luna* Millen, Schrödl, Vargas & Indacochea, 1994

Perú (Millen et al., 1994; Paredes et al., 1999; Schrödl, 2003)

Family Polyceridae

*Polycera alabe* Collier & Farmer, 1964

Perú (Paredes et al., 1999)

*Thecacera darwini* Pruvot-Fol, 1950

Perú (Schrödl, 1999a)

Superfamily Eudoridacea

Family Cadlinidae

*Cadlina sparsa* (Odhner, 1922)

Perú (Paredes et al., 1999)

Family Chromodorididae

*Glossodoris baumanni* (Bertsch, 1970)

Tumbes: Cancas (present study)

*Hypselodoris agassizii* (Bergh, 1894)

Perú (Paredes et al., 1999)

Tumbes: Cancas (present study)

*Tyrinna evelinae* (Er. Marcus, 1958)

Perú (Paredes et al., 1999; Schrödl, 2003)

Family Dendrodorididae

*Doriopsilla janaina* Marcus & Marcus, 1967

Tumbes: Cancas (present study)

Family Discodorididae

*Rostanga pulchra* MacFarland, 1905

Perú (Álamo & Valdivieso, 1987; Paredes et al., 1999)

*Diaulula punctulata* (d'Orbigny, 1837)

Perú (Paredes et al., 1999)\*

Callao (Dall, 1909\*; Álamo & Valdivieso, 1987)

\*Cited as *Anisodoris punctulata*

*Baptodoris peruviana* (d'Orbigny, 1837)

Perú (Paredes et al., 1999\*°; Schrödl, 2003°)

Lima: Pucusana (Schrödl, 1996)°

Callao (Dall, 1909#; Álamo & Valdivieso, 1987+):

San Lorenzo Island (d'Orbigny, 1835-47)\*

\*Cited as *Doris peruviana*

°Cited as *Platydorid punctatella*

°Cited as *Platydorid peruviana*

■Cited as *Doriopsis peruviana*

+Cited as *Dendrodoris peruviana*

*Gargamella immaculata* Bergh, 1894

Perú (Schrödl, 1999b)

Family Dorididae

*Doris fontainei* (d'Orbigny, 1837)

Perú (Schrödl, 1999b)

\* Cited as *Anisodoris fontaini*

Suborder Dendronotoidea

Superfamily Dendronotoidea

Family Dendronotidae

*Dendronotus frondosus* (Ascanius, 1774)

Perú (Paredes et al., 1999)

Family Dotidae  
*Doto uva* Er. Marcus, 1955  
Perú (Paredes et al., 1999; Schrödl, 1999b)  
 Suborder Armininae  
 Family Arminidae  
*Armina cuvieri* (d'Orbigny, 1837)  
Piura: Paita (Dall, 1909)\*  
 \* Cited as *Pleurophyllidia cuvieri*  
 Suborder Aeolidioidea  
 Superfamily Euaeolidiacea  
 Family Flabellinidae  
*Flabellina cynara* (Marcus & Marcus, 1967)  
Piura: Máncora (present study)  
Tumbes: Punta Sal, Cancas (present study)  
*Flabellina falklandica* (Elliot, 1907)  
Perú (Paredes et al., 1999)  
*Flabellina* sp.2  
Perú (Schrödl, 2003)  
 Family Tergipedidae  
*Cuthona* sp.  
Tumbes: Cancas (present study)

Family Fionidae  
*Fiona pinnata* (Eschscholtz, 1831)  
Perú (Paredes et al., 1999; Schrödl, 2003); (Paredes et al., 1999)\*  
Lima: 13° South (Dall, 1909; Álamo & Valdivieso, 1987)\*  
 \* Cited as *Phidiana natans*  
 Family Facelinidae  
 Subfamily Facelininae  
*Bajaeolis bertschi* Gosliner & Behrens, 1986  
Perú (Paredes et al., 1999)  
Tumbes: Cancas (present study)  
Piura: Máncora, Pocitas (present study)  
*Phidiana lottini* (Lesson, 1831)  
Perú (Paredes et al., 1999; Schrödl, 2003)  
Callao (Dall, 1909\*; Álamo & Valdivieso, 1987\*; Schrödl, 1999b)  
 \* Cited as *Phidiana inca*  
 Family Aeolidiidae  
*Aeolidia serotina* Bergh, 1837  
Perú (Paredes et al., 1999)

Table 1. Number of new species reported per author for the Peruvian coast

Author (Year)	Number of new reported species
d'Orbigny (1835-46)	6
Dall (1909)	9
Peña (1970)	1
Keen (1971)	1
Gosliner (1980)	1
Álamo & Valdivieso (1987)	3
Millen, Schrödl, Vargas & Indacochea (1994)	1
Schrödl (1996; 1999a, b; 2003)	4 and 1 undescribed
Paredes et al.(1999)	15
Nakamura (present study)	3 and 1 undescribed
<b>Total</b>	<b>46</b>

### Acknowledgments

This work has been possible with the help of Ángel Valdés, who shared his knowledge as well as his hospitality during my visit at the Malacology Laboratory at the Natural History Museum of Los Angeles County, where all laboratory facilities were made available to me for which I am very thankful. The SEM work was conducted at the Natural History Museum of Los Angeles County facility supported by the US National Science Foundation MRI grant DBI-0216506 and the

help of Giar-Ann Kung.

Special regards to Armando Valdés and Alicia Kuroiwa for their patience and suggestions and who made a working place available for me at their office at the Conservaton Biology Unit at Cayetano Heredia Foundation. Aldo Indacochea and James McLean kindly provided me pertinent literature for this project. My appreciation to Dave Behrens and Bill Rudman for helping me with identifications. And special thanks to my aunt Momo for her constant support and encouragement.

Table 2. Species found, locality, depth range (m) and number of specimens collected

Species	Locality	Depth range (m)	Habitat description	Specimens collected
<i>Dolabrifera dolabrifera</i> (Rang, 1828)	Punta Sal	Intertidal	Algae over rocks	1
<i>Bajaeolis bertschi</i> Gosliner & Behrens, 1986	Cancas	3-8 m	Coral	4
	Máncora	Intertidal	Under rocks	3
	Pocitas	Intertidal	Algae over rocks	4
<i>Elysia diomedea</i> (Bergh, 1894)	Máncora	Intertidal	Between rocks*	2
<i>Hypselodoris agassizii</i> (Bergh, 1894)	Cancas	7-8 m	Over rocks	1
<i>Glossodoris baumannii</i> (Bertsch, 1970)	Cancas	5-8 m	Over rocks	4
<i>Doriopsilla janaina</i> Marcus & Marcus, 1967	Cancas	3 m	Over rocks	4
<i>Flabellina cynara</i> (Marcus & Marcus, 1967)	Cancas	3-7 m	Coral	6
	Punta Sal	Intertidal	Algae over rocks	1
	Máncora	Intertidal	Between rocks•	4
<i>Cuthona</i> sp.	Cancas	5-7 m	Coral	1
Total				35

\* Also found (abundantly) at intertidal sandy zone at Punta Sal, but no specimens were collected.

•Also found at Pocitas, between rocks and algae, but no specimens were collected.

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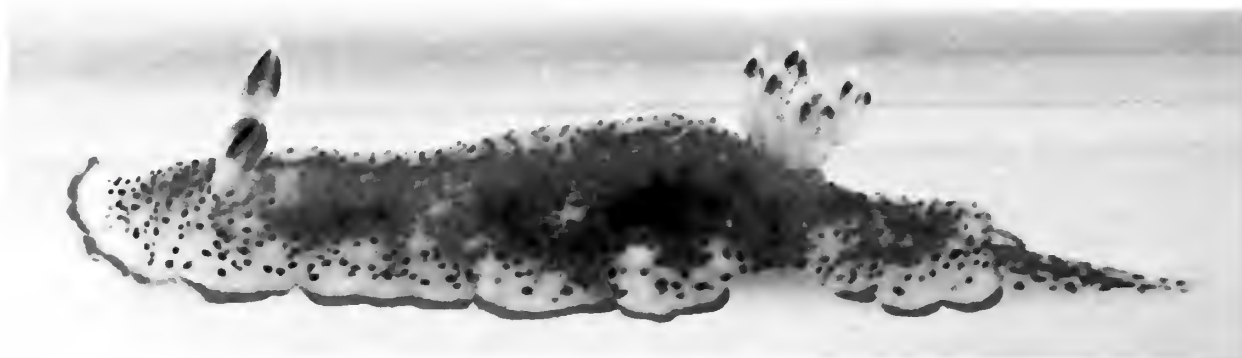


Figure 1. (A) *Glossodoris baumanni* (Bertsch, 1970) (B) radula (C) rachidian, lateral and marginal teeth (D) outer marginal teeth.

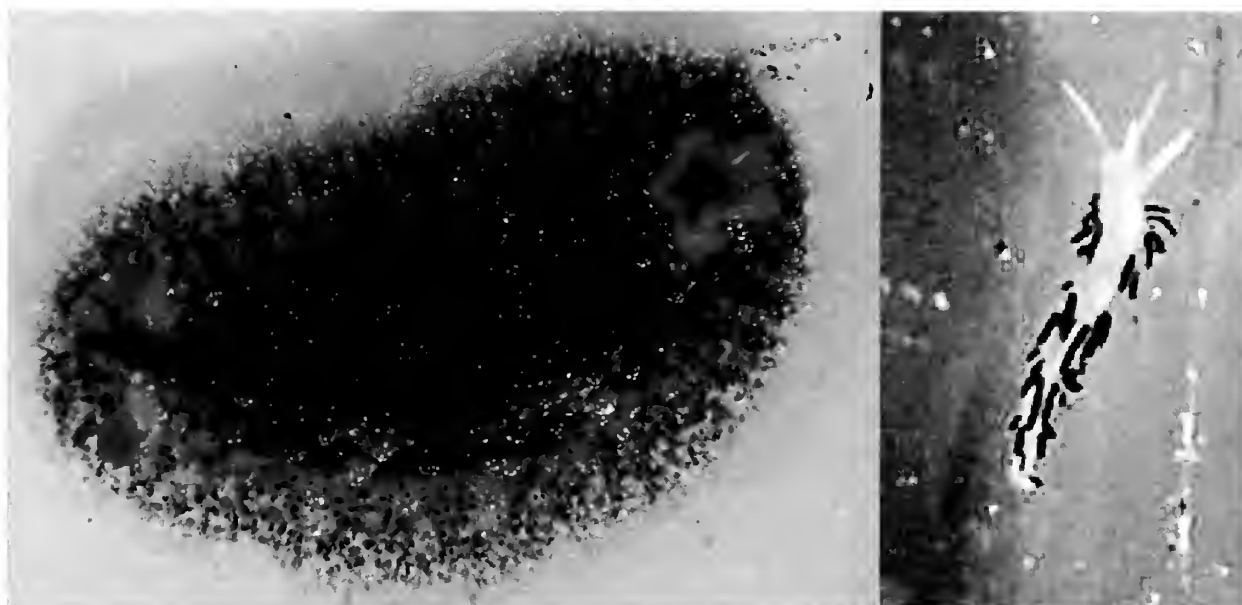


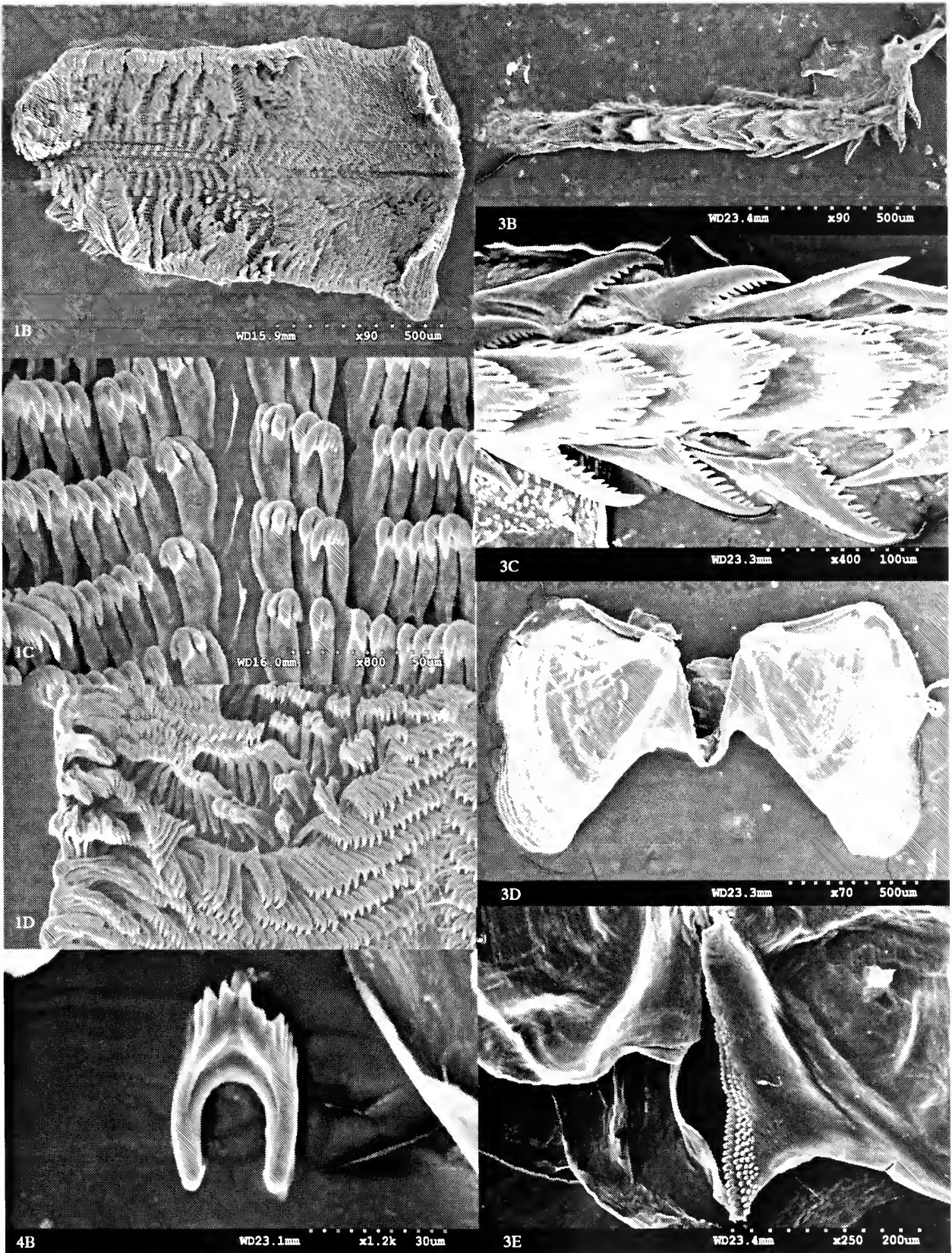
Figure 2 (A) *Doriopsilla janaina* Marcus & Marcus, 1967.

Figure 4 (A) *Cuthona* sp. (B) radular tooth



Figure 3 (A) *Flabellina cynara* (Marcus & Marcus, 1967) (B) radula (C) rachidian and lateral teeth (D) jaw (E) masticatory edge.







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# THE FESTIVUS

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## PROGRAM

### SMALL BOAT DREDGING IN THE GOOD OLD DAYS

Carol Skoglund, Club member and author, will  
present a slide show on collecting with a small boat

dredge, dredging trips she's taken and images of the  
wonderful treasures she's found dredging.

Meeting date: August 17, 2006

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## CLUB NEWS

**Minutes of the San Diego Shell Club Meeting  
July 20, 2006**

At 7:50 p.m. President Bill Schneider called the meeting to order. The minutes of the previous meeting were approved as published in *The Festivus*.

The date of the September Party has been set for September 9<sup>th</sup> at the home of Larry and Debbie Catarius. A sign-up for potluck items was circulated among the membership present.

Carole Hertz made a call for papers to be published in *The Festivus* beginning in 2007 and Librarian Marilyn Goldammer urged greater use of the lending library.

Vice-President John LaGrange introduced the speaker of the evening, Peter Brueggeman, Director of the Scripps Institution of Oceanography Library. SCUBA diving under the six foot thick ice of McMurdo Station in Antarctica, and observing and photographing its benthic organisms, led Peter to produce a field guide for Antarctic organisms that is available on his website, <[scilib.ucsd.edu/sio/nsf](http://scilib.ucsd.edu/sio/nsf)>. Working with a team from the National Science Foundation during 1997-99, Peter dove south of New Zealand at 77°S through holes in the ice drilled by an auger. Three distinct field depths were defined in the dark and icy water.

In the shallows to 45 ft, colorful echinoderms, including starfish and sea urchins, predominated. From 45 to 100 ft were seen: sea anemones, bush sponges, snow white nudibranchs, soft corals, and six foot long worms.

At 100+ft much shell debris was evident. A rare chiton grew to a length of 12 cm. Sponges were monitored that had not grown within a span of ten years. Mollusks observed and photographed included the gastropods, *Marseniopsis* sp; a naticid; an Antarctic whelk, 9 cm. long; and a Trophon sp. whose drilling attacks took 20 to 29 days. In the 8 months of the year spent in darkness, some molluscan meals occurred only every 9 months.

Also occurring at the 100+ft level was the dorid nudibranch, *Doris kerguelensis*, which was widely distributed. Scallops and sea urchins also were visible at this level. The Antarctic scallop, *Admusium colbecki*, was commonly seen. Juveniles often attached themselves to the shells of the adults; this behavior not only provided the young with rapid deployment in the event of predatory attack, but also moved them more

efficiently to sources of food in the still water. Growth lines on *Yoldia* sp. yielded the information that a 3.5 cm individual had lived for 65 years!

Many questions from the audience were answered following this most interesting program. Adjournment and the coffee hour followed. David Waller's homemade cookies were well received. The evening's shell drawing was won by George Kennedy.

**Molluscs 2006 - Molluscs in Research,  
Conservation and the Economy**

Preliminary Notice of Triennial meeting of the Malacological Society of Australasia 6 - 8 December 2006, University of Wollongong, NSW plus two day pre and post conference workshops (4-5th Dec, 9-10 Dec).

The objective of this meeting is to bring together students, established researchers, naturalists and members of government and NGO agencies that have an interest in molluscs. The meeting will focus on current research involving molluscs in the Australasian area.

Molluscs are the second largest animal phylum and many are ecologically and economically important. They are dominant organisms in marine environments and have suffered more human-induced extinctions on land and in freshwaters than seen in all tetrapod vertebrates.

**Themes:** \* Applied studies (aquaculture, fisheries, parasitology, invasive species)

\* Conservation and ecology (including endangered species, indicator species, molluscs in experimental ecology, tracking environmental changes)

\* Systematics (including taxonomy, phylogeny, evolution, faunistics, biogeography)

\* Genetics and development (population genetics, evolution-development, larval development)

**Venue:** McKinnon Centre, University of Wollongong. Wollongong is about 1.5 hr by road or rail south of Sydney. Details on other options for travel to Wollongong from Sydney provided on the conference website: [www.uow.edu.au/conferences/MOLLUSCS06/](http://www.uow.edu.au/conferences/MOLLUSCS06/)

**Registration** on line at:  
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For more information contact:

Mark Norman: [mnorman@museum.vic.gov.au](mailto:mnorman@museum.vic.gov.au)  
or Winston Ponder: [wponder@bigpond.net.au](mailto:wponder@bigpond.net.au)

## NOTES ON *LONGCHAEUS CLAVULUS* (A. ADAMS IN SOWERBY, 1854) (GASTROPODA: PYRAMIDELLOIDEA: PYRAMIDELLIDAE)

KIRSTIE L. KAISER<sup>1</sup>

Associate, Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road, Santa Barbara, CA 93105, USA  
E-mail: [klkaiser@prodigy.net.mx](mailto:klkaiser@prodigy.net.mx)

Pyramidellids are small, marine ectoparasitic snails which usually live in subtidal to deep water and prefer muddy or sandy bottoms. The majority feed on annelid worms and will often stay on, or close to, their host. Shells are usually small, some up to 20 mm and typically elongate, although a few species are trochiform to planispiral. The protoconch is normally smooth and heterostrophic (Ponder & De Keyser, 1998).

*Longchaeus clavulus*, a rather elusive shell, was reported in Keen (1971), as *Pyramidella moffati*, from the type locality, Acapulco, México. The only distribution record, was recorded from Los Cóbano, El Salvador by Hernández C. (1992). Several museum collections were checked for this species. Only the Natural History Museum of Los Angeles County (LACM) reported *L. clavulus* in their collections. One lot of two specimens is from Islas Secas, Panamá (LACM 35-86), the other lot also containing two specimens is from Bahía Nuevos, Costa Rica (LACM 72-33). Other museums checked for this species, were the Santa Barbara Museum of Natural History (SBMNH), the American Museum of Natural History (AMNH) and the San Diego Natural History Museum (SDNHM) but none were located.

During the Smithsonian Tropical Research Institute Costa Rica Expedition aboard the R/V Urracá, I collected two specimens while using SCUBA in a sandy area with occasional turnable rubble at a depth of 15 feet (5 m). Both were empty shells and the best preserved specimen is shown here in Figure 1.

This species, which has a fairly complex nomenclatural history, was first described as *Obeliscus clavulus* A. Adams, in Sowerby, 1854 (fig. 33), type locality Acapulco, México. The image is reproduced

here in Figure 2. Dall and Bartsch (1906) considered *Obeliscus clavulus* to be preoccupied and proposed the replacement name *Pyramidella (Pharcidella) moffati*. In 1909, Dall and Bartsch re-described *P. moffati*, and figured it in a line drawing which was reprinted by Keen (1971, fig. 1886, top). Dall and Bartsch noted that the specimen in the Berlin Museum, that they were working with at that time and considered to be *P. moffati* was labeled "*Obeliscus achates* Gould, cf. *crocatus* A. Adams, Japan." The specimen had a very small shell, *Anachis diminuta* C. B. Adams, firmly wedged in its aperture. Since *Anachis diminuta* comes from the Panamic Province, they thought *P. moffati*, occurred in the same region. Thus, the specimen that they were describing as *moffati* did not have reliable data.

Corgan (1973) explained that *Pyramidella moffati* was an unnecessary replacement name for *Obeliscus clavulus*. He concluded that according to the International Code of Zoological Nomenclature, the species should be cited as *Longchaeus (Pharcidella) clavulus*. Corgan accepted the placement in the genus *Longchaeus* Mörch, 1875, as ranked by Bartsch (1955), but wrote that "assignment to the subgenus *Pharcidella* does not seem prudent. The characteristics of *Pharcidella* Dall, 1889, are poorly understood since the type species, *Pyramidella (Pharcidella) folini* Dall (1889:334) has never been illustrated or described in detail."

In conclusion, two new distributional records are herein recorded for *Longchaeus clavulus*: Costa Rica and Panamá, extending the distribution from Acapulco, México, to Panamá. In addition, this is the first published color photograph of this uncommon species.

My appreciation goes to Henry W. Chaney and

<sup>1</sup>Mailing address: Paseo de las Conchas Chinas #115 Depto.4, Fracc. Conchas Chinas, Puerto Vallarta, Jalisco, C.P. 48390, México.

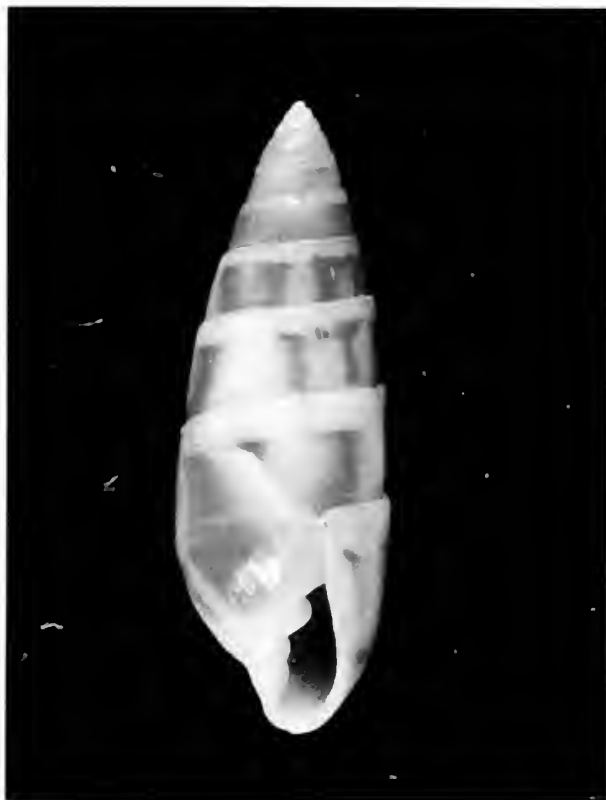


Figure 1. *Longchaeus clavulus* (A. Adams in Sowerby, 1854). Bahía Potrero, Islas Santa Catalina, Costa Rica, 10° 28.896' N, 085° 52.210' W. Leg. K.L. Kaiser. Size: 11 mm. K.L. Kaiser Collection. Photo: Patricia Sedeghian (SBMNH).

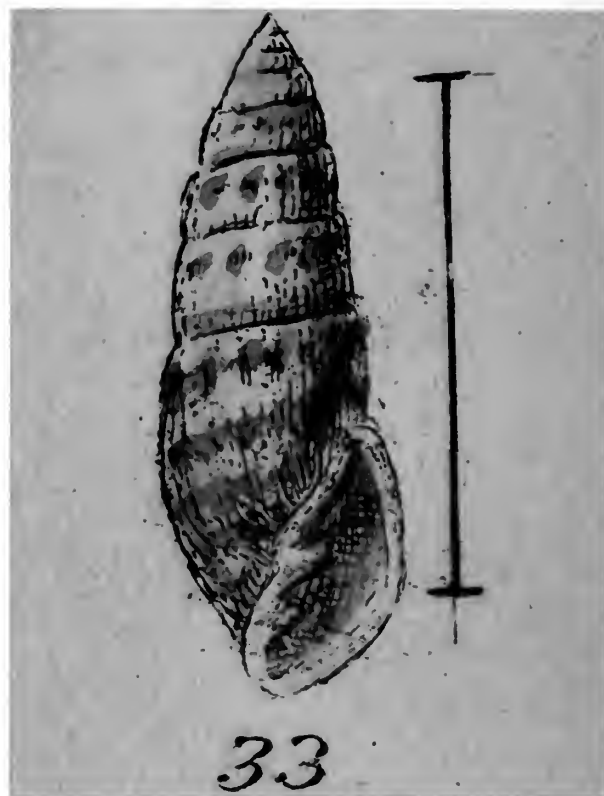


Figure 2. Holotype, *Obeliscus clavulus* A. Adams in Sowerby, 1854. Image from Sowerby, 1854, pl. 171, fig. 33. Photo: Patricia Sedeghian (SBMNH).

Patricia Sedeghian (SBMNH), Lindsey T. Groves (LACM), Carole M. Hertz (SDNHM) and Susan Hewitt (AMNH) for checking the respective collections and to Carol Skoglund for her comments on the original draft. A very special thanks to R. Ross Robertson of the Smithsonian Tropical Research Institute who was organizer and chief scientist of the Expedition and to the captain and crew of the R/V Urracá.

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## A MEMORABLE JOURNEY TO A REMOTE SOUTH ATLANTIC ISLAND

MARILYN J. GOLDAMMER

10051 Sheba Way, San Diego, California 92129, USA

E-mail: mgoldammer@san.rr.com

When I mention the name St. Helena, which I visited from April 30, 1983 to June 5, 1983, people often look at me quizzically and ask if I mean Mt. St. Helens in Washington State. They couldn't be further from the truth as St. Helena is a small, remote island situated in the tropical South Atlantic, 1500 miles northwest of Cape Town, South Africa, and approximately 1800 miles east of Brazil (Figure 1). In 1983, I had the great fortune to tag along and assist with a National Geographic Grant study of the cetacean fauna and former dolphin fishery on the Island of St. Helena.

The island is one of three British colonies located in the middle of the South Atlantic, with Ascension Island lying 700 miles to the north and Tristan da Cunha approximately 1200 miles to the south. St. Helena is accessible only by boat as it has no airport, and sailing across the South Atlantic is an experience not easily forgotten. We boarded the RMS *Centaur* in Cape Town, South Africa, and spent five days at sea, spotting only one school of dolphins approximately 300 miles out, a pod of sperm whales, one Minke whale, and one bird, which I suspect was a petrel. It was a delight to finally spot land as we approached Jamestown, the island's capital (Figure 2). Because the boat continued on to England it would be five weeks before it would return from England on its way back to Cape Town.

St. Helena is a beautiful volcanic island, a land of contrasts, from desert to hillsides with lush vegetation. Its coastline is spectacular with cliffs as high as 1,000 feet. The island occupies approximately 47 sq. miles, and its highest point, Diana's Peak, rises 2,685 feet above sea level. Historically, it is probably best known as the place of Napoleon Bonaparte's exile after his defeat at the Battle of Waterloo in 1815. He died there in 1821 and was buried on the island until 1840 when his body was exhumed, shipped to France and reburied on the banks of the Seine, as he requested in his will. The island was also used to house Boer War prisoners at the turn of the 20<sup>th</sup> century.

The uninhabited island of St. Helena was originally

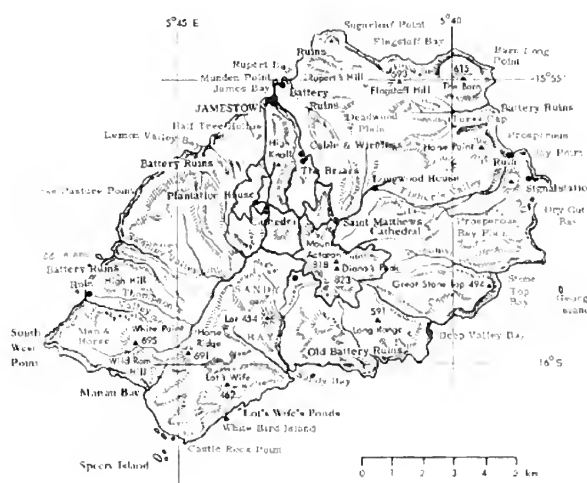


Figure 1. Map of the Island of St. Helena.

discovered by the Portuguese in 1502. It has since changed hands from the Dutch to the British East India Company, back to the Dutch, and then back again to the East India Company, and ultimately as a colony of the British Crown in 1834. The East India Company had maintained the island as a stop-off point on its voyage to India via the Cape of Good Hope, and the port of Jamestown was established as a permanent settlement in 1659. The island prospered as a port of call until the Suez Canal was built in 1869. Its construction reduced the need for long voyages via the Cape of Good Hope, weakening St. Helena's economy to its current status, fully subsidized by England.

The St. Helenians, or "Saints" as they are known, are a friendly and unique people. They are descendants of slaves and indentured workers from Africa and the East and from British settlers sent out by the East India Company. We spent many hours meeting, interviewing, and socializing with the Saints, and they treated us with great warmth and made us feel at home.





Figure 2. View of St. Helena, taken from the deck of the RMS Centaur.

Despite spending five weeks on the island, our collecting time was somewhat limited, and what we did collect proved rather disappointing. Most of the shells we collected or that were given to us by fishermen and residents were dead collected and in relatively poor condition. We were able to do some dredging during the time we spent on a fishing boat hired in our search for dolphins. We were also able to fish with hand lines or bamboo poles (no rods and reels), a new experience for us. Our snorkeling trips were not very productive for collecting either. Rupert's Bay, on the northwest shore, was a beautiful area for snorkeling with many magnificent fish, but no visible shells. Sandy Bay, on the southeast shore, was far too rough for snorkeling, but we found a few shells in the splash zone such as Patellidae sp. (2), Littorinidae sp. (6), and *Thais* sp. (4). The rocky beach just before Egg Island, on the west shore, produced eight specimens of the limpet *Patella concolor* (Krauss, 1848) intertidally.

It was very exciting to learn that we had three world size record specimens. Included in these specimens was *Cypraea spurca sanctaehelena* (Schilder, 1930) (Figure 3), 33.1 mm, collected dead on the beach by a St. Helenian fisherman. Of note is that in *A Guide to Worldwide Cowries* by Lorenz & Hubert, 1993, the species is listed as *C. acicularis sanctaehelena* and it states that "the deltoidal shape and entirely white base indicate that this sub-species sometimes attributed to *spurca* rather belongs to *acicularis*." (We also received four smaller specimens of the same species, three from St. Helena and one from Ascension Island.)

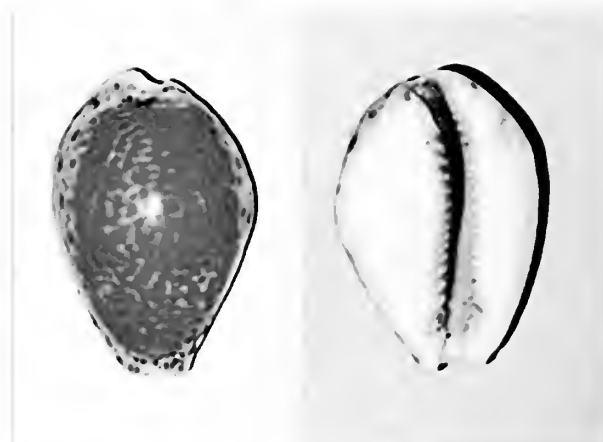


Figure 3. *Cypraea spurca sanctaehelena* (Schilder, 1930), 33.1 mm.

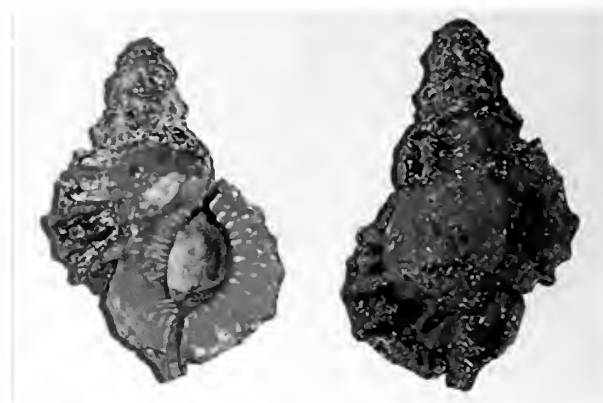


Figure 4. *Bursa corrugata pustulosa* (Perry, 1811), 93.0 mm.

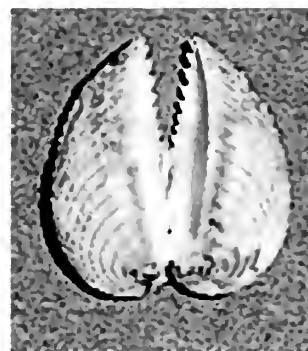


Figure 5. *Trigoniocardia speciosa* (Adams & Reeve, 1850), 27.7 mm.

A 93.0 mm crabbed specimen of *Bursa corrugata pustulosa* (Perry, 1811) (Figure 4) caught by fishermen in a lobster trap off Jamestown, St. Helena, at approximately 10 fm (18 m) is also a world record size. Two smaller crabbed specimens were also caught in 10 fm (18 m), one in a lobster trap and one in a crayfish trap.

The third specimen, *Trigoniocardia speciosa* (Adams & Reeve, 1850) (Figure 5), 27.7 mm, is noted as a world record size only because it has never appeared in the record book (pers. comm, Don Pisor). We collected it and a smaller one while dredging in Jamestown Bay, St. Helena, at 15 fm (27 m), May 1983.

Despite our meager findings, listed below, the experience of living on St. Helena for five weeks is one I will always cherish. If I had the opportunity, I would return in a heartbeat. The British government is planning to build an airport by 2010!

#### Other Finds

Crabbed by fishermen in lobster trap at approximately 10 fm off St. Helena

*Cypraecassis testiculus senegalica* (Gmelin, 1791) (2)

*Cymatium cf parthenopeum* (von Salis, 1793) (1)

*Charonia lampas* (Linnaeus, 1758) (1)

Self-collected dead while dredging in Jamestown Bay, St. Helena, at approximately 15-40 fm

*Pecten* sp. (2), *Cancilla* sp. (2), *Tellina* sp. (3)

Collected dead on beach

*Nerita ascensionis* (Gmelin, 1791), on Ascension Island by fisherman (4)

*Cypraea lurida oceanica* (Linnaeus, 1758) on Sandy Bay, one self-collected, the other from resident (2)

*Pisania pusio* (Linnaeus, 1758) on Ascension Island by fisherman (1)

*Conus titianus* (Hwass, 1792) one on St. Helena, the other on Ascension Island by fisherman (2)

#### Acknowledgments

I wish to thank Don Pisor for his generous help in identifying several of the specimens, and especially for recognizing the world record size shells that will be added to his 2006 Registry. I also wish to thank Carole Hertz for her general review and feedback and for assuring me that this article would not put its readers to sleep.

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# THE FESTIVUS

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There is no regular meeting this month.

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## CLUB NEWS

**Minutes of the San Diego Shell Club Meeting  
August 17, 2006**

President Bill Schneider called the meeting to order at 7:50 p.m. Guests Will and Laurie from Waco, Texas were welcomed, as was longtime member Barbara Myers and son Mike. The minutes of the July meeting were approved as published in *The Festivus*.

Vice-President John LaGrange announced that October's meeting would feature a talk by Kelvin Barwick. As to the prospect of the club's possible assistance in monitoring the molluscan fauna of the Batiquitos Lagoon, he has discovered that no intertidal estuaries in San Diego County are open for that purpose, thereby effectively canceling out any help we might have rendered. He is looking elsewhere for possible field trips.

Librarian Marilyn Goldammer announced that there will be a sale of reprints, magazines and books at the October meeting and *The Festivus* editor Carole Hertz requested papers for publication in the year 2007.

The sign-up sheet for the September Party was sent around, with a request that potluck dishes serve 12 people. Wine and soft drinks will be provided by the club.

Kelvin Barwick announced the upcoming SCAMIT meeting to be held on the morning of September 11<sup>th</sup> at the Santa Barbara Museum of Natural History. The primary topic of the meeting will be the bivalve group Nuculanidae. All interested parties are welcome to attend.

The speaker of the evening, Carol Skoglund, was introduced as being an "amazing resource for Panamic shells." Her slide show encompassed high points of many years of dredging. She presented the techniques that her late husband, Paul, had developed for many successful years of shell collecting by dredging. They dredged from the Gulf of California localities south in Mexico to Costa Rica, and Panama. Many unusual, rare and beautiful species were photographed, researched by Carol and shown during her talk. She left us with her words of wisdom: "Do your homework, see what you got, then turn it over to an expert."

The evening's door prize was won by guest, Laurie Appel, who, as a novice, was thrilled.

Adjournment came at 8:40 p.m., followed by refreshments at the coffee table. Cookies were brought

by John Bishop and Marilyn Goldammer.

Nancy Schneider

**Notice of New Publications**

*The Conchological Iconography, Part 12, the Family Pectinidae* by Bret T. Raines and Guido T. Poppe is announced as a comprehensive reference to this large family.

"The volume comprises 2 sections, a 402 page section of text and black and white illustrations and a 320 page section of color plates. The b/w section covers 143 text plates with 1,354 photos and 242 maps. The color plates have 2,015 photos including 26 showing live animals and 268 photos as identification tools." The volume is "loose-leaf punched for 4-hole binder."

Donald Dan announces that the volume is expected in the US in October of this year with the price: \$360 plus domestic rate mailing cost estimated at \$7.50. Two full size (75 mm/3 in. thick) 4-hole A4 binders are required to hold the two sections. Binders are sold at \$14.00 ea. There will be no additional mailing charge when ordered with the book.

For further information or to order, contact Donald Dan, 6704 Overlook Drive, Fort Myers, FL 33919 or call 239-481-6704.

Rüdiger Bieler, guest editor of the *Zoological Journal of the Linnean Society*, announces its upcoming publication of an issue dedicated to Bivalvia systematics, with segments by worldwide bivalve specialists on different large branches of the bivalve tree.

"The volume provides an excellent overview of the state of bivalve systematics today, the directions being pursued, the tools being applied and developed, and also points to many questions (and taxa) in need of further study."

For further information, contact Rüdiger Bieler at [bieler@fieldmuseum.org](mailto:bieler@fieldmuseum.org) or the publishing company at [Davina.quarterman@oxon.blackwellpublishing.com](mailto:Davina.quarterman@oxon.blackwellpublishing.com)

**Change of address**

Edward A. Boyd, 18218-197 Paradisent Rd., Valley Center, CA 92082. Ph. 760-458-3201

## A NOTE ON THE OPISTHOBRANCHS OF PARQUE NACIONAL DE COIBA, PANAMÁ (TROPICAL EASTERN PACIFIC)

ALICIA HERMOSILLO

Universidad de Guadalajara, Centro Universitario de Ciencias Biológicas y Agropecuarias  
Las Agujas, Zapopan, Jalisco, México  
E-mail: alicia\_hg@prodigy.net.mx

YOLANDA E. CAMACHO-GARCÍA

Museo de Zoología, Escuela de Biología, Universidad de Costa Rica  
San Pedro de Montes de Oca, San José, Costa Rica  
E-mail: ycamacho@inbio.ac.cr

### Background

Hermosillo (2004) published a list of the 75 species of opisthobranch mollusks she recorded at Parque Nacional de Coiba during a Smithsonian Tropical Research Institute expedition in May 2003 aboard the R/V Urracá. According to Hermosillo (2004), the island of Coiba and all its surrounding islands and islets were declared a national park in 1991 and is now one of the most extensive parks in the world with 53,582 hectares of land surface and 216,543 hectares of marine sanctuaries. One very important update is that diligent efforts of Dr. Todd Capson, Dr. Alicia Ibañez, Dr. Ross Robertson, Dr. Héctor Guzmán, Mr. Joe Pigozzi and other Smithsonian Tropical Research Institute scientists resulted in the inclusion of Parque Nacional de Coiba in UNESCO World Heritage Status in 2005. Hermosillo (2004) reported 22 species that were range extensions, not previously known for Panamá or anywhere else south of Panamá and 10 were undescribed species. Currently, all of these taxa are in the process of being described or are in press.

The present paper contains the findings from a parallel STRI project of Camacho-García that combined with data from Hermosillo (2004) increases the total number of opisthobranch species reported in the Park to 89. The material collected has been deposited at the Natural History Museum of Los Angeles County (LACM), Smithsonian Tropical Research Institution (STRI), and the Zoology Museum at the University of

Costa Rica (UCR) as shown in Table 1.

### Discussion

In March 2006, Hermosillo was invited to return to Parque Nacional de Coiba to participate in a very interesting project with the following objectives:

1. Collect cyanobacteria, corals, algae and their grazers (basically opisthobranch mollusks) for the isolation of natural products, looking for chemicals that are active cures for diseases such as malaria, dengue fever, AIDS, cancer, etc.
2. Study trophic relationships at the level of chemical ecology; ideally finding associations such as *Dolabella auricularia* and *Symploca* spp. that would involve novel and biologically active natural products. These ecological associations would provide necessary information to adequately and sustainably use these resources, should they yield interesting chemicals.
3. Collect mollusks that have not been studied previously but could potentially have interesting active chemicals.
4. Increase knowledge of the biodiversity of the area, by adding to the species count of Hermosillo's previous inventory.

The scientists participating in the project were: Dr. Todd Capson (STRI), a biochemist working on the discovery and development of medicines from natural sources; Kathryn Clark, a graduate student working on her thesis with Dr. Capson; Dr. Angela Capper (STRI,

Table 1. Opisthobranch species added to the Coiba 2003 STRI Expedition inventory in Hermosillo (2004)

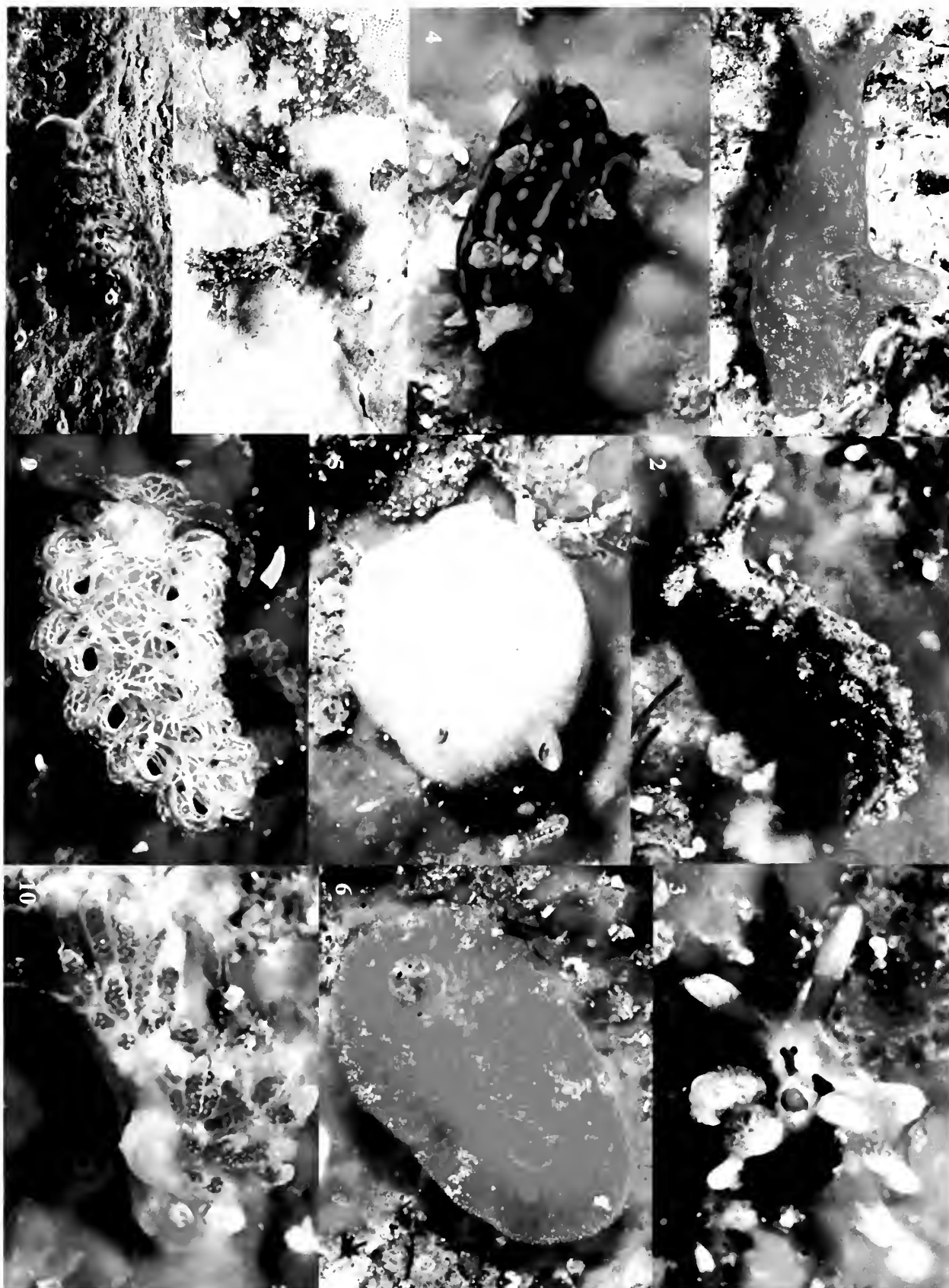
\*Photographs only, as no specimens were collected or deposited.

Subclass OPISTHOBRANCHIA	Size range (mm)	Depth range (m)	Locality (number of specimens)	Repository
<i>Aplysia californica</i> Cooper, 1863 (Figure 1)		14	Islas sin nombre (1)	UCR
<i>Elysia</i> sp. 1 (in Behrens & Hermosillo, 2005)	5	10	Canales de Afuera (1)	STRI
<i>Elysia</i> sp. 2 (in Camacho-García et al., 2005) (Figure 2)		4-5	Isla Granitos de Oro (2), Isla Uva (1)	UCR
<i>Costasiella</i> sp. (Figure 3)		4	Isla Uva (1)	UCR
<i>Polycera</i> sp. (in Camacho-García et al., 2005) (Figure 4)		4	Isla Uva (1)	UCR
<i>Cadlina</i> sp. (in Camacho-García et al., 2005) (Figure 5)		4	Isla Uva (5)	UCR
<i>Aldisa</i> sp. (Figure 6)		4	Isla Uva (1)	UCR
<i>Doriopsilla janaina</i> Marcus & Marcus, 1967	12 - 21	1 - 7	Canales de Afuera (2), Isla Contreras (2) Isla de Coiba east side, Bahía Damas (1)	Photograph*
<i>Bornella sarape</i> Bertsch, 1980 (Figure 7)	7 - 19	8	Coiba NE, El Rosario (2)	LACM 172858
<i>Noumeaella isa</i> Marcus & Marcus, 1970 (Figure 9)		3.6	Isla Granitos de Oro (1)	UCR
<i>Antaeolidiella indica</i> Bergh, 1888	17	6	Canales de Afuera (1)	Photograph*
<i>Limenandra nodosa</i> Haefelfinger & Stamm, 1958	9 - 11	Intertidal	Isla de Coiba east side, Bahía Damas (2)	Photograph*
<i>Cuthona lizae</i> Orso & Valdés, 2003 (Figure 10)		3.6	Isla Granitos de Oro (1)	UCR
<i>Cuthona</i> sp. 4 (in Behrens & Hermosillo, 2005) (Figure 8)	8 - 18	Intertidal	Isla de Coiba east side, Bahía Damas (8)	LACM 172860

## Figure captions

- Figure 1. *Aplysia californica*, 11 mm. Photo: Y. Camacho  
 Figure 2. *Elysia* sp. 2, 3 mm. Photo: Y. Camacho  
 Figure 3. *Costasiella* sp., 3 mm. Photo: Y. Camacho  
 Figure 4. *Polycera* sp. 3.1 mm. Photo: Y. Camacho  
 Figure 5. *Cadlina* sp., 3 mm. Photo: Y. Camacho  
 Figure 6. *Aldisa* sp. 5 mm. Photo: Y. Camacho  
 Figure 7. *Bornella sarape*, 18 mm. Photo: A. Hermosillo  
 Figure 8. *Cuthona* sp., 9 mm. Photo: A. Hermosillo  
 Figure 9. *Noumeaella isa*, 4 mm. Photo: Y. Camacho  
 Figure 10. *Cuthona lizae*, 3 mm. Photo Y. Camacho







Florida), an expert in the study of cyanobacteria and the ecology of the animals that feed on them and Dr. Alicia Ibáñez (STRI), an expert taxonomist working on the flora of Parque Nacional de Coiba for the past seven years.

In previous studies: Todd Capson and Héctor Guzmán found active antimalarial substances in soft corals endemic to Parque Nacional de Coiba. In June 2004, a species of *Leptolyngbya* (cyanobacteria) collected off the western side of Isla de Coiba yielded some extremely interesting chemistry. Apparently, *Leptolyngbya* has not been as widely studied as genera such as *Lyngbya* and *Symploca*. These were fundamental to substantiate the arguments to promote the conservation of the marine environment of Parque Nacional de Coiba.

This bioprospection project seeks to take advantage of the biodiversity of Panamá and promote conservation. An investment of \$1.8 million has been made in Panamanian laboratories and in forming human resources (84 Panamá Nationals, 14 working on their Masters and 6 on their PhDs).

Concurrently, Camacho-García was also working at Coiba, as a participant of an expedition with Dr. Peter Glynn (University of Miami - U of M), Dr. Juan Mate (STRI), and other researchers and students from the University of California, Los Angeles (UCLA), University of Miami (U of M), University of Costa Rica (UCR), and the Natural History Museum of Los Angeles County (LACM).

Among the main goals of the trip was to study certain effects of El Niño and monitor the health of coral reefs at Isla Uva and other localities, measure erosion, collect DNA coral samples for future molecular studies, and study predation by setting traps at Isla Uva. As part of this project, Dr. Glynn invited three other researchers to work on the inventory of the biodiversity

of opisthobranch mollusks, decapods and polychaetes of Coiba.

### Results

Opisthobranch species included in the Coiba 2003 STRI Expedition inventory in Hermosillo (2004) are shown here in Table 1. *Limnandora nodosa*, *Antaeolidiella indica* and *Doriopsilla janaina* have been reported before in Panamá but were not included in Hermosillo's previous annotated list of species. The southernmost reports for *Polycera* sp., *Cuthona* sp. 4, *Elysia* sp. 1, *Elysia* sp. 2, *Cadlina* sp. and *Aplysia californica* were from Costa Rica (Camacho-García et al., 2005) so the present report extends their known distributions to the south.

Both *Bornella sarape* and *Cuthona lizae* had previously been reported from the Golfo de California to Bahía de Banderas, Jalisco, México. This is the first time these species have been observed outside México, extending the known range from 21°N to 7°N.

*Noumeaella isa* is a species previously found only in Madagascar and reported here for the first time in the tropical Americas.

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## REPORT OF THE AMS/WSM MEETING - 2006

JULES HERTZ<sup>1</sup>

Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road, Santa Barbara, California 93105-2936, USA

The combined meeting of the American Malacological Society (AMS) and Western Society of Malacologists (WSM) was held 29 July-3 August 2006, at the University of Washington, Seattle, Washington. It was the 72<sup>nd</sup> annual meeting of AMS and the 39<sup>th</sup> annual meeting of WSM. The meeting was organized and ably run by Roland Anderson who was President of both societies in 2006. The meeting was attended by 155 registrants, many from such far-off places as Russia, Denmark, Brazil and Western Australia. Many of the presenters and attendees were students which bodes well for the future of malacology.

The meeting officially opened on the 29<sup>th</sup> with registration and a reception at the Burke Museum. The reception featured a wine bar and a food line with a variety of cheeses, fruits and veggies. It was a great way to meet with old friends and make new acquaintances in a beautiful display area.

The technical programs began on the 30<sup>th</sup> with concurrent sessions, the Cephalopod Behavior symposium and Molluscan Potpourri (part 1). I attended the Cephalopod Behavior Symposium and heard some excellent papers. One by Janet Voight was on "Observations of deep-sea octopodid behavior from undersea vehicles." She observed and sometimes was able to capture with the manipulator arm of the submersible, octopuses at hydrothermal vents at depths in excess of 2000 meters. Octopuses in the genera *Benthoctopus*, *Graneledone* and *Vulcanoctopus* were observed and differences in their activity levels, wariness and egg-brooding behavior were studied. She found that chemoreception and tactile input are likely key ways in which deep-sea octopuses locate prey. Another fascinating paper was "Sucker-arm coordination of Octopus in grasping and manipulation" presented by F. W. Grasso. His presentation included video clips demonstrating how octopuses use their arms and suckers in lifting and maneuvering large objects

through narrow openings. He found that in many cases the animals used a combination of arm movements in combination with different groups of suckers, the larger suckers at the distal end having greater adhesion force, to accomplish their tasks. The object of the experiments was to simulate how octopuses are able to extract prey from crevices and burrows and open bivalve shells.

I attended part of the Molluscan Potpourri session and listened to a very interesting and thought-provoking paper entitled "*Comus* radular characters in taxonomy and phylogeny: congruence with molecular genetics?" presented by Alan Kohn. In a 1999 study, Nishi and Kohn showed that nine radular characters were sufficient, either singly or in combination, to distinguish as distinct from each other a set of 11 closely related molluscivorous *Comus* species on the basis of shell characters. In the current study, Kohn and Meyer showed that in preliminary studies radular tooth characters in two piscivorous *Comus* species groups also indicate a taxonomy derived from radula and shell characters and a phylogeny consistent with that based on molecular genetics.

At the end of Cephalopod Symposium, two staff members of the Seattle Aquarium dissected a Giant Pacific octopus. This was viewed by a large crowd of cephalopod enthusiasts armed with flashing cameras.

The second day of technical papers featured a Chiton Symposium in one room and a Molluscan Potpourri (part 2) in a second room. I opted to attend the Chiton Symposium organized by Doug Eernisse. He started the session with an extensive overview of advances in Chiton research touching on many of the subjects to be covered by later presenters. I particularly enjoyed the paper by J. Pojeta, Jr. and J. DuFoe entitled "*Echinochiton dufoei* (Polyplacophora): new reconstruction." This fossil species was described in 2003 from one poorly preserved complete specimen. Two newly discovered specimens fill in the gap of

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<sup>1</sup> 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA.

known information. In one, all eight valves are preserved with the right and anterior hollow spines of five valves and a rounded head valve with four spines, two pointing laterally and two pointing anteriorly. The second specimen preserves most of the anterior four valves. Hollow spines are preserved anteriorly and on both lateral sides. Neither specimen shows the presence of dorsally projecting scutes lateral to the head valve as occur between the valves and spines of the other seven valves. This paper was augmented by a poster in the poster session and viewers were able to examine the actual fossils and the bedding material at that time. Another interesting chiton paper was "Fertilization biology elucidates chiton evolution" by J. Buckland-Nicks. In this talk, we were shown, with the aid of excellent SEMs, the different fertilization methods by chiton species in several families with different types of sperm. This knowledge allows one to achieve a more accurate phylogeny of chitons.

On 1 August, I attended the Opisthobranch Workshop organized by Sandra Millen. She opened the session with a comprehensive review of opisthobranch research in the last decade. Two papers of particular interest to me were "Developmental mode in opisthobranch molluscs from the eastern tropical Pacific" by J.H.R. Goddard and A. Hermosillo and "The type collection of specimens described by Rudolph Bergh and housed in the Zoological Museum, Copenhagen" by K.R. Jensen. In the first paper, Jeff Goddard described the study of 51 species of opisthobranchs found at intertidal and subtidal sites near Puerto Vallarta. Mode of development is now known for 67 species of benthic, shallow-water nudibranchs from the eastern tropical Pacific based on this study combined with previously existing data. In the second talk, Kathe Jensen described the vast output of the Danish anatomist, Rudolph Bergh with its many nomenclatural problems, and her attempt at locating his type specimens in the Zoological Museum in Copenhagen. Many of Bergh's species descriptions are almost impossible to find and her project was like the unraveling of a murder mystery. At the end of this session there was a poster session in which some 20<sup>+</sup> posters were pinned to the walls of the main auditorium

and the presenters were available to discuss their projects and answer questions.

The second social event of the meeting was held on the evening of 1 August. This was a reprint sale and auction of books, art and miscellanea. All money raised was to go toward student grants. There was a wine bar and appetizers available to get the audience into a buying mood. George Kennedy ran the reprint sale and Paul Callomon ran the auction. Paul is a natural comedian and a terrific auctioneer, and he quickly had the audience eating out of his hand. He was knowledgeable about the books for sale and had the attendees overbidding as they laughed at his antics. The auction was an outstanding success and a fun evening enjoyed by all.

Presentations on the final day were on freshwater and terrestrial mollusks. Also discussed was the concern over the spreading of introduced species.

That afternoon both the AMS and WSM had their business meetings, and in the evening we all went to the University Club for the banquet. The wine was plentiful and the food was outstanding. The special guest speaker for the evening was Dr. Peter Ward, paleontologist and professor of Geological Sciences at the University of Washington. He is also affiliated with the Departments of Biology and Astrophysics. His talk was on the causes of mass extinctions other than meteor strikes. He talked of the great extinctions of life on earth based on the fossil record. He found low levels of oxygen based on fossil evidence corresponding to four previous mass extinctions. He thinks we are presently in the process of a mass extinction and global warming, changing ocean currents, and upwelling of noxious materials could contribute to lower oxygen levels and extinction of some species.

A field trip to Deception Pass State Park was the last event of the meeting. The meeting was very successful thanks to the careful planning of Roland Anderson and the excellent people he chose to run the individual symposia. All the social events were outstanding. The attendance was high and the presence of so many bright and active students was encouraging.

Plate 1 is a montage showing some of the attendees.

### Figure captions for Plate 1

Top row, left to right: Jules Hertz, George Metz, Charlotte Norrid, Carol Skoglund, Kirstie Kaiser, Roger & Kaila Clark.

Middle row, left to right: Chris Kitting, George Kennedy, Jim McLean, Hiroshi Saito, Janet Voight.

Bottom row, left to right: John Pojeta Jr. & Jimmie DuFoe, Carole Hickman, Tom & Beatrice Burch, José Leal & Kim Nealon, Paul Callomon, Roland Anderson.







## BOOK NEWS

*Guide to Marine Invertebrates, Alaska to Baja California*, 2<sup>nd</sup> Edition (Revised)

Publisher: Sea Challengers, Monterey, California (ISBN 0-930118-37-5)

By: Dan Gotshall. 2005

vi + 117 pp., profusely illustrated, softbound

Price: \$29.95, plus tax, shipping & handling

Following the decades-long tradition of *Sea Challengers* publications, this field guide to the most common northeast Pacific cooler water inter- and subtidal invertebrates blends informative and well-written text with excellent color photographs. The result is an almost "identification guarantee" for sea creatures discussed in this book.

Given the present oceanic habitat and biodiversity degradation, our knowledge of the distribution, abundance and natural history (including temporal or geographic variations of these patterns) is essential to conservation efforts. The task before scientists is daunting. However, today there is a large assisting cadre of concerned and informed citizens (amateur only in the sense they do not have a diploma in these academic specialties) who are willing and able to provide experience, specimens, and photographic and observational data. Correct identification at the species level is fundamental to proper use of this information. In this regard, Dan Gotshall's book provides a most useful manual. His introductory comments on conservation, overharvesting, and establishment of marine reserves (no-take zones are a proven benefit for increasing biodiversity, abundance and size of both non- and commercially harvested species) is a heartfelt call for our involvement.

Since this is a revised 2<sup>nd</sup> edition, my comments will focus on the differences between these two works. GTMI-1994 (the 1<sup>st</sup> edition) contained 253 species, whereas GTMI-2005 (the 2<sup>nd</sup> edition) contains 286 numbered species. Totals given in the Introduction of added species are wrong; GTMI-2005 actually has 35 additional numbered species (note there are 4, not 3, tunicates); 2 species from GTMI-1994 have not been included. Hence the numbered species difference of 33 is accounted for; we must also include the unnumbered *Balticina septentrionalis* on the back cover, giving a total of 287 species illustrated and described, 36 of which were not in GTMI-1994.

The introductory comments to Porifera, Cnidaria,

Ctenophora, Platyhelminthes, Annelida, Mollusca, Arthropoda, Bryozoa and echinoderms (except for the omitted prey/predator statement) in GTMI-2005 have no textual changes from the 1<sup>st</sup> edition. There are almost no changes in the text of species reported in both editions.

The few changes include updated taxonomy (see species numbers 14, 33, 46, 47, 65, 80, 137, 159 and 286) and range limits (see species 66, 69, 80, 81, 159, 181 and 188). The pictures of only 3 species common between both editions have been changed (species 87, 174 and 188). There is a formatting change, narrower picture width (gained by cropping the original picture, not changing its size) and a larger column width.

The groups with the largest numbers of newly added species are in the always-difficult-to-identify-but-ecologically-important sponges (7 species) and mollusks (12 opisthobranch species, 3 of which prey on sponges). Especially noteworthy (in both editions) are the superb in situ photographs of the siphons of the burrowing clams.

Regrettably incorrect orthography of Spanish language place names often appear (especially lack of accents). Some of the "typos" may have resulted from the format change to wider columns.

My personal favorite of all the species included is *Heterocrypta occidentalis*. I remember first seeing it while diving in La Jolla Canyon years before the publication of GTMI-1994, and then at home anxiously flipping through the text of Wheeler North's (1976) classic book, *Underwater California*, to try to identify the animal. Suddenly I saw the name "Elbow Crab," glanced at North's detailed line drawing, and said "Eureka!" Today the use of full color underwater photographs has replaced meticulously exquisite line drawings in faunal and floral field guides. Wheeler J. North, to whom both the 1994 and 2005 editions have been dedicated, is certainly proud of his friend and student Dan's *Guide to Marine Invertebrates*.

Hans Bertsch  
hansmarvida@sbcglobal.net



# THE FESTIVUS

A publication of the San Diego Shell Club

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### A few Common and Uncommon Shelled Mollusks From Offshore San Diego

Kelvin Barwick, of the City of San Diego EMTS  
Laboratory and a Club member, will give a PowerPoint

presentation on some of the interesting mollusks found during  
his work monitoring the waters off San Diego.

### Big Reprint and Book Sale

Meeting date: October 19, 2006

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## CLUB NEWS

### The Annual September Party

If you missed it, you missed a goodie! Debbie and Larry Catarius really know how to give a great party.

About 26 members and guests attended the party on Saturday, September 9<sup>th</sup> and enjoyed the beautiful day, the surroundings of the Catarius' home, being with the many friends attending and the mountain of wonderful food – just about all homemade fixins! Wine, beer and soft drinks were provided by the Club as always.

There were some not often seen dishes, as well, such as Dragonfruit (purple and delicious), abalone (heard of that lately?), smoked yellowtail and marinated, spicy tuna. As is well known, San Diego Shell Club members love to eat.

Conversation was animated, people toured through Debbie and Larry's lovely home with much for shell collectors to admire, and some enjoyed looking at Larry's fine shell collection. All hated to leave this very pleasant gathering.

The Club thanks Debbie and Larry for once again hosting a terrific September party.

### The September SCAMIT Meeting

The September meeting of the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) was held at the Santa Barbara Museum of Natural History (SBMNH) on Monday the 11<sup>th</sup>. It was convened by SCAMIT president Kelvin Barwick and was one of their few meetings treating the Mollusca – this one on the Nuculanidae.

Kelvin made the presentation of the day on the bivalve genus *Nuculana*, with the assistance of SBMNH curator Paul Valentich-Scott. Kelvin's beautiful PowerPoint program comparing the local species of *Nuculana* made for lively discussions among the over 17 attendees. Interest (and humor) was high as this difficult group of Californian species were shown side by side – *acapulcensis*, *elenensis*, *penderi*, *taphria* and others with some photos of type material.

Lunch time provided a much needed rest from all the muscle scars, sinuses, dentition and spiral sculpture and all piled into several vehicles and met at *Taffy's* a terrific, casual lunch spot with a big umbrella covered table for fifteen ready for us on their patio. Much great conversation and banter at lunch – with nary a mention of nuculanids.

After lunch those remaining moved downstairs at the museum and looked at more nuculanids with some specimens under the scope projected on the wall. The aim was to come to some conclusions. Much information was shared and progress was made. BUT – this is a tough group – not the members, the nuculanids!

### A New Marginella Book Announced

Brian Hayes of Algoa Bay Specimen Shells <algoabay@yebo.co.za> announces a new *Marginella* book entitled *Marginellidae and Cystiscidae of the World Atlas* with over 2,600 photos by Tiziano Cossignani. The book with 408 pages has 500 types represented. The price is \$210 US plus postage.

### Changes of Address

Clark, Roger & Kaila, 7537 Snowy Owl Road, Eagle Mountain, Utah, 84043-4376. E-mail: insignis@emcity.net

Green, David & Lucille, 3522 Bassett Court, Missouri City, TX 77459. Phone: 281-778-9151. E-mail: dgreen@entouch.net

### Molluscs 2006 at the University of Wollongong

Details of the Molluscs 2006 meeting at the University of Wollongong, New South Wales, Australia from 6-8 December are available at <http://www.uow.edu.au/conferences/MOLLUSCS06/> (Wollongong is a short drive south of Sydney.)

A list of keynote speakers is on the website. The full program will be available in late November. There is a pre-conference workshop on Cephalopod Taxonomy on 4-5 Dec. and a post-conference workshop on Eastern Australian Land Snails on 9-10 Dec. Details are on the website. Early bird registration is available until 30th October.

There are special rates for Malacological Society of Australasia members and students. Registration is online through the conference website.

The MSA publishes Molluscan Research – see <http://www.mapress.com/mr/about.htm>

Please make this information available to others who might be interested.

Winston Ponder



## LOOKING FOR *PRIOTROCHATELLA* (PROSOBRANCHIA: HELICINIDAE) ON CUBA'S ISLE OF PINES

MICHAEL SMALL

12 Lambton Avenue, Ottawa, Ontario K1M 0Z5

E-mail: michaelsmall@sympatico.ca

Terrestrial mollusks have received comparatively little attention in *The Festivus*. This is understandable, given the rich marine molluscan fauna to be found in the Panamic and Californian provinces near the doorsteps of most readers of this journal. However, from 2000 - 2003, I had an unusual opportunity to live and work in one of the world's great centers of landshell biodiversity - Cuba. It took me a while to figure out that instead of spending my time on the reefs around the island looking for marine mollusks of the sort found across the Caribbean, I should turn my gaze inland and start looking at rock faces and patches of forest where Cuba's rich terrestrial mollusks live. The vast majority of these mollusks are found nowhere else. According to Espinosa and Ortea (1999), of the 1401 species and subspecies of landshells named from Cuba, no less than 1299 are endemic to the island. The majority of these are endemic to a more restricted region within Cuba, such as the karstic hills in the western province of Pinar del Rio, or the marine terraces at the extreme eastern tip of the island in the province of Guantánamo. Most amazing of all are the number of Cuban landshell species which are local endemics, restricted by topography and microclimates to only a few square kilometers.

An extreme example of local endemism occurs in the genus *Priotrochatella* (H. Fischer, 1893) in the family *Helicinidae* (Latreille, 1825). The genus has three species in Cuba: *P. constellata* (Morelet, 1847), *P. stellata* (Poey, 1851) and *P. torrei* (Clapp, 1918). These three species live only on a large island off the southern coast of western Cuba, known historically as the Isle of Pines. The island is approximately 50 by 60 kilometers, separated from the main island of Cuba by a shallow sea. The edge of the continental shelf runs along the southern shore of the island. Some of Cuba's most famous diving spots are on the on the south-west point of the island at Punta Francés, where several Cuban divers have set world records for free-diving.

Much of the rest of the island, however, is fairly undramatic: scrubby forest on hard coral ground in the southern third of the island and open grassy plains with scattered palms and a few low hills around the center and northern half of the island. The countryside is scattered with the abandoned concrete hulks of the many secondary schools built on the island when it was a center of "socialist education" for thousands of students from Africa and Asia during the late seventies and eighties. To celebrate this era, the Cuban government changed the island's name in 1976 to the Isla de Juventud. The international youth brigades are now gone and the remaining population of about 70,000 people mostly live around the main port on the north coast, Nueva Gerona.

Two long low hills on either side of Nueva Gerona constitute the entire habitat of the three locally endemic species of *Priotrochatella*. On the east side of town is the Sierra de Caballos - a hill about three kilometers long, several hundred meters wide and no more than 150 meters high (Figure 1). The sierra is covered by long grass around the sides and clumps of trees on top, with outcrops of grey boulders which appear to be metamorphic rock (Figure 2). There is a gravel road to the top of the southern end built to reach an unmanned transmitter station. This hill is the only known habitat of *Priotrochatella stellata* (Figure 3).

On the other side of town is a slightly longer and higher hill, the Sierra de Casas. Urban gardens within the perimeter of Nueva Gerona run right up to the northern base of the hill. In the middle on the eastern side is a famous marble quarry, which is one of the premier sources of building stone in Cuba and which has resulted in a large chunk being taken out of the side of the hill. About two thirds of the way down the sierra is a saddle and a narrow forested pass, with farms on either side, which divides the sierra in two. Nearby is a modest 19<sup>th</sup> century farmhouse, La Abre, which has



been preserved as a historic site as the home for a few months of the great Cuban poet and apostle of independence, José Martí. The southern end of the sierra has some high exposed rock faces, sheltered in places by forest. The northern end of the sierra is the sole habitat of *Priotrochatella constellata* (Figure 4), while the southern end is the only known habitat of *Priotrochatella torrei* (Figure 5).

I visited the Isla de Juventud on diplomatic business in early February 2003, followed by a long weekend devoted to malacology. After a day of diving off the southern coast, I decided to turn my attention to looking for the three species of *Priotrochatella*. I rented a tourist taxi for the day from the one tourist hotel on the island, the El Colony (famous for its sunsets and sand-flies), and headed first to the Sierra de las Casas.

I started on the western side of the southern end of the sierra. I picked a spot, opposite a small dam, where the hill rose up in fairly steep slope with lots of large rock surfaces exposed, starting almost at the road level and running up the hill for 50 meters or more. The rock was all marble or quartzite. The slope was partially shaded by forest and tufts of grass. At first I found a few dead *P. torrei* in the leaf litter around the base of the boulders. Then moving up into more shaded areas, I started looking inside the crevices where the boulders were piled against each other, or against rock outcrops. Here, inside these crevices, I was able to find my first live *Priotrochatella torrei*. February is the dry season in western Cuba and most landshells in this time period are estivating in crevices. Reportedly, they are easy to find in the rainy season when they emerge exposed on the boulders and rock faces, but this was not my experience.

After this initial success, I drove on about 3 km to the northern end of the sierra, just before the dirt track joined a back street of Nueva Gerona, in order to look for the most heavily sculptured species of the genus, *P. constellata*. The terrain was similar to the southern end, but the exposed boulders and rock faces were higher up the slope. Although I found a few dead ones quickly at the base of the boulders, it took about an hour of hard scrabbling to find my first live *P. constellata*, wedged into a tiny crevice in an exposed rock face along the upper slope. I returned the next day and followed a trail along the base of the rock face near the top of the sierra, to where there were more boulders and better forest cover. This area produced more, deeper crevices and I was rewarded by finding three more live *P. constellata*.

A final spot in the Sierra de las Casas which I explored was the hillsides on either side of the saddle on

the eastern side, starting just behind the historic farmhouse of La Abre. The heavily wooded hills behind the farm-house did not prove productive, but then I hiked across the gardens that occupied the flat land of the saddle and an open field to reach a steep cliff face on the southern side of the saddle. I quickly found a couple of live *P. torrei* clinging to the rock-face in the shade above a small ledge at eye-level. Other dead specimens could be found in the leaf litter at the base of the cliff face. Finally, I looked around the wooded boulders next to the farmhouse, on the north side of the saddle, and found one dead *P. torrei*. In general, the saddle would seem to be a natural barrier to the distribution of the two *Priotrochatella* species found on the Sierra de las Casas - but this one dead shell of *P. torrei* suggests it is not an absolute barrier to movement of these mollusks. However, in no spot on the sierra did I find *P. torrei* and *P. constellata* together.

On my last day, I decided to look for the third species, *Priotrochatella stellata*, on the slopes of the Sierra de Caballos. After a couple of abortive attempts looking around rocky slopes and forest at the northern end (behind the abandoned "Cuban-North Korea Friendship School"), I drove around the southern end and started up the dirt road towards the transmitter station. Off to the right were some boulders and rock outcrops almost identical to the habitat where I found *P. constellata* the day before on the other sierra. I hiked up the hillside and began peering inside the crevices where boulders leaned against the rock face. This effort was soon rewarded by finding several live *P. stellata*, clinging flush to the rock faces, sheltered from the sun deep inside the crevices. It was very satisfying to have found all three local endemics in just two days of searching.

All three Cuban species of *Priotrochatella* are small but very beautiful shells. They average only about 10 mm in diameter, with a deeply serrated edge to each whorl. Each has a different elevation of its spire and serration around the body whorl, giving each a distinctive appearance. *Priotrochatella constellata* has the highest spire, and its triangular teeth are offset on each whorl, giving it the appearance of an Oriental pagoda. The shells of all three species are pale green to lemon yellow, with white triangles on the body, and white or pinkish teeth. When live, the shells appear a little darker, as the integument of the live animal is solid black (Figure 6). The plates accompanying this article show all three species and the habitat where I collected them on the Isle of Pines.

Clench and Jacobsen, working from the rich



Figure 1. View of the Sierra de Caballos from the west with radio tower on the summit.



Figure 2. Hillside habitat for *Priotrochatella*. Sierra de Caballos



Figure 3. *Priotrochatella stellata* found estivating on Sierra de Caballos.



Figure 4. *Priotrochatella constellata* found on Sierra de Casas.



Figure 5. *Priotrochatella torrei* found on Sierra de Casas.



Figure 6. *Priotrochatella torrei* moving over a rock.  
Photo: Adrian González Guillen

holdings of Cuban shells in Harvard's Museum of Comparative Zoology, produced a short monograph dedicated to the genus *Priotrochatella* (Clench & Jacobsen, 1970). According to them, the only other species in the genus is *P. josephinae* (C.B. Adams, 1849) which is found in Jamaica. They do not give further details on how widespread it is there. Clench and Jacobsen surmise that based on the westerly flow of water currents in the Caribbean, the genus came originally from Jamaica and was transported to the Isle of Pines, where it divided into three new species. How this genus came to distributed between these two large and widely separated Caribbean islands, but restricted in

Cuba to only two specific hills on the Isle of Pines is an intriguing question of biogeography. It would merit further research.

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-



## IN REMEMBRANCE OF JAMES ROBERT LANCE

It was a shock to learn, at the recent AMS/WSM meeting, that the respected, long-time researcher on opisthobranchs (and longtime Club member) Jim Lance had died on February 24<sup>th</sup> of this year at the age of 78. During his career Jim had written many well-received papers on opisthobranchs, although despite many of his plans, he had never written for *The Festivus*. We received a last e-mail from Jim on 13 July of last year

with more definite plans to publish a paper in *The Festivus*. This time he had even included the photos to be used.

As a tribute to Jim, we have decided to publish his last e-mail letter to us, including the images he'd sent, for what was to be his first paper in *The Festivus*. Naturally we responded that we would be delighted to publish his work at long last.

"Dear Carole and Jules:

"How about a voice from the past? I was obliged to move up to this small Oregon town (Lebanon) a couple of years ago in order to take care of my aged (95 yrs) mother's affairs and attend to matters of real estate, trusts and the like...legal details which are very different from those in California. Leaving my Pacific Beach home after 50 yrs. and giving up access to my beloved Scripps library and aquarium and lab facilities has been quite traumatic. One good thing ... now that the worst is over, I've been able to overcome my total computer illiteracy by taking several courses at the local community college and bought myself a fairly good system especially in order to digitize my some 10K opistho slides. Besides, nobody was writing to me anymore. Jim McLean put it succinctly, "I'll answer your question but this will be my last hand written note." I've noticed that I have a harder time learning at 77 than I had in earlier years. I expect to remain up here for the present.

"Although I've published practically nothing in the last couple of decades I have been actively observing, collecting and photographing in the field ... especially in the Gulf and along the Nayarit coast ... over the past 50 and 30 years respectively. Indeed, many of my favorite sites, such as La Cruz Juanacastle, Aticama, El Anclote, Sayulita, Santa Cruz, Matenchen Beach to mention a few, have become so degraded or destroyed in the intertidal areas as to no longer be productive. As I recall, you have collected at Sayulita ... now the hills of that charming little village are covered with the homes of zillionaires and much of the intertidal is barren ... at least 'branch-wise'. Oh, woe!

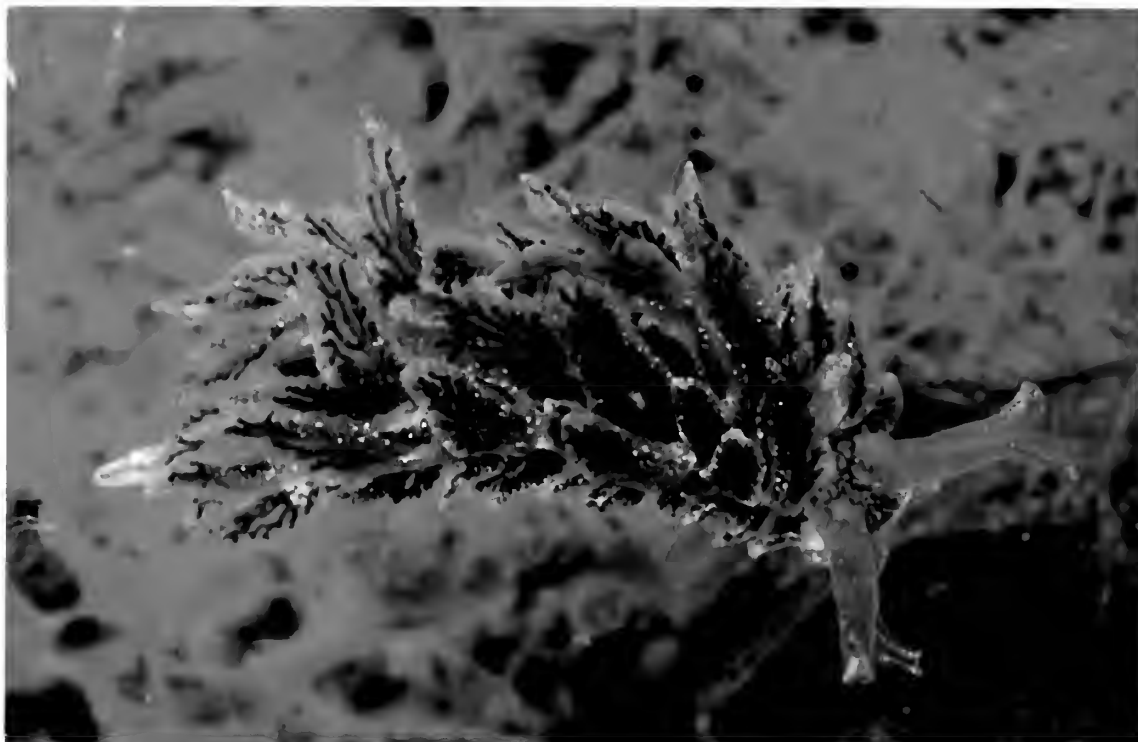
"I've been carefully reading *The Festivus* Panamic opisthobranch articles (Hermosillo, Angulo-Campillo, etc.) as well as those by Valdes, Bertsch, Gosliner and his students appearing in Calif. Acad. Veliger, etc. Most of these people have worked primarily in the subtidal and preserved their samples soon after collection. I have worked mainly in the intertidal and returned "buckets-o-branches" live to Scripps and my own home aquaria thus enabling further life history observations.

"I'm writing to see if *The Festivus* might be interested in some of these studies. Particularly I had in mind something like an annotated list of opisthos from the Nayarit coast. This would compliment Hermosillo's publication on subtidals from Banderas Bay (my sites include three locations within said bay). Also I have a lot of firsts for the Eastern Pacific (for example I'm attaching a terrific sacco find, the European *Caliphylla mediterranea*) which was present for only a couple of years at Pt. Mita...before the golf course was built.

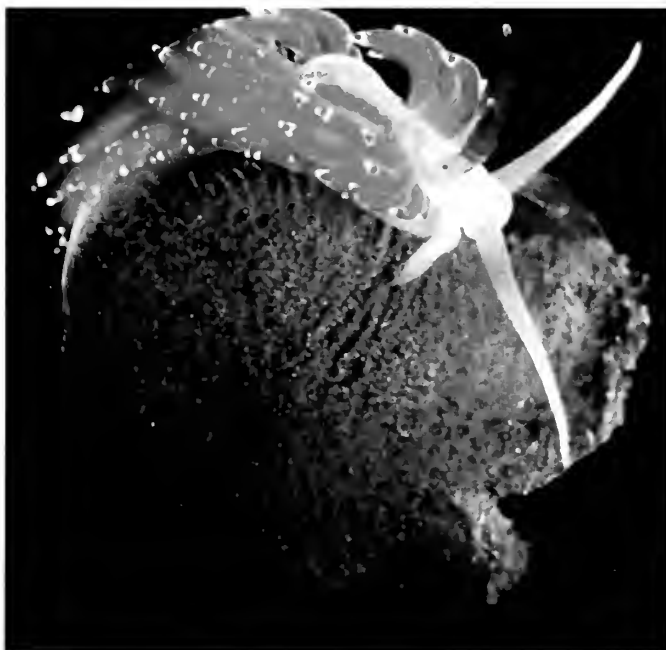
"Don Cadien and I found a single 1.8 mm specimen of the opisthobranch egg eater *Favorinus elenalexiae*. I returned it alive kept it in culture till death and kept a detailed photo record. A couple of attachments enclosed. I have much data and would hate to see all this early Panamic stuff never see the light of publication. I hope you are interested.

Yours with regards,  
Jim Lance"





*Caliphylla mediterranea*



*Favorinus elenalexiae* searching for food



*Favorinus elenalexiae* feeding



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## MEMBERSHIP AND SUBSCRIPTION

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Website at: <http://www.sandiegoshellclub@terryarnold.net>  
E-mail: [cmhertz@pacbell.net](mailto:cmhertz@pacbell.net)

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## PROGRAM

### SHARE A SHELL – TELL A TALE

This meeting will be interactive with members sharing a shell(s) important to them. Each person will show his/her shell(s) and give a brief story telling about it. It should be great fun. Bring a shell and participate!!

Also, Wes Farmer will show slides taken from last year's great Club auction.

Meeting date: November 16, 2006

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## CLUB NEWS

### Minutes of the San Diego Shell Club Meeting October 19, 2006

Vice-President John LaGrange called the meeting to order at 7:45 p.m. New member Rachel Cano and guest Donovan Garcia were made to feel welcome. The minutes of the previous meeting were approved as published in *The Festivus*.

Treasurer Silvana Vollero reported the Club was still solvent. Vice-President LaGrange announced next month's speaker, Paul Kanner. He has also lined up a talk on pink abalone for the January meeting.

Jules Hertz announced the slate of officers for 2007. They are: President, John LaGrange; Vice President, Carole Hertz; Recording Secretary, Nancy Schneider; Corresponding Secretary, Marilyn Goldammer and Treasurer, Silvana Vollero. These candidates, and nominations from the floor, will be voted on next month and installed at the Christmas Party in December.

The Butcher Shop on Kearny Mesa will be the site of this year's Christmas Party, to be held on Saturday evening December 2<sup>nd</sup>. Tickets are \$30 and Richard Herrmann will present one of his fantastic slide shows (see column 2, this page).

Wes Farmer, Botanical Society Representative, announced that he had made a reservation for our meeting room for 2008.

John introduced the speaker of the evening, member Kelvin Barwick, photographer extraordinaire. As an employee of the Ocean Monitoring Division of the City of San Diego, Kelvin works primarily in taxonomy of invertebrate species collected. Waste water outfalls occur at two San Diego localities, Point Loma and South Bay. Some 175 million gallons of wastewater daily are delivered via a nine-foot diameter pipe at the Pt. Loma site. Two seagoing vessels monitor numerous sites in the locality. The water is then sampled for quality in the lab, with resulting data forwarded to the proper agencies. Kelvin presented a program on *Common and Uncommon Shelled Mollusks from off San Diego*, illustrated by his micro-photography. Tiny, yet perfectly formed, mollusk shells were projected on the screen in great detail. A lively discussion followed his excellent program.

Ron Deems was the lucky winner of the evening's door prize. The meeting was adjourned at 8:50 p.m. Donated books and reprints sold briskly at the back tables both before and after the meeting.

Larry Catarius and John LaGrange brought

homemade cookies and brownies to go with the coffee served afterward.

Nancy Schneider

### The Club's Annual Christmas Dinner Party Saturday evening, December 2<sup>nd</sup>

On Saturday evening December 2<sup>nd</sup> the Club will host its annual Christmas Dinner Party at the Butcher Shop [5255 Kearny Villa Rd, San Diego. Phone 858-565-2272], It's the only time all its members and guests come "dressed up." It's a great party with terrific program and delicious food.

This year the menu is as follows -- Dinner starts with a Classic Caesar Salad and dinner rolls and butter. Choice of entrees are: Mahi-Mahi Fillet charbroiled and topped with cilantro-lime sauce or Prime Rib of Beef served au jus with creamed horseradish, both entrees served with garlic mashed potatoes and fresh vegetables. Vegetarian entrees are also available. This is followed by a luscious dessert of Carrot Cake and choice of tea or coffee. As always, the Club will provide the table wine.

The cost of the evening including tax and gratuity is \$30. Reservations (including check with choice of entree noted) must be received by Wednesday, November 29<sup>th</sup>. Either bring your payment to the November meeting or send it to the Club address on the front page.

Richard Herrmann's fantastic slide program will be the highlight of the party and the evening and will conclude with the Club's traditional annual gift exchange. Remember to bring a wrapped shell gift (with only general locality data on the outside of the package) to place under the tree. Only those who bring shells, or shell related items, can enjoy the fun of the holiday gift exchange! This is always a very special evening. Plan to come and enjoy the season with your friends in the Club.

### The Blue Slip for Renewal

The blue slip for your membership renewal is in the envelope with this issue. Please make your membership checks payable to The San Diego Shell Club and send them to the Club address on the front page or bring them to the November meeting. All memberships received after October 1<sup>st</sup> are considered to be for the year 2007. Please return the form even if your dues have already been paid.

## ARCHIBALD MCCLURE STRONG, A PROLIFIC AMATEUR

June 18, 1876 - July 14, 1951

CAROLE M. HERTZ<sup>1</sup>

Associate, Santa Barbara Museum of Natural History, Department of Invertebrate Zoology,  
2559 Puesta del Sol Road, Santa Barbara, CA 93105-2936, USA

Archibald McClure Strong (Figure 1), who preferred to be known in his malacological writings as A. M. Strong, was born in Westminster, California, in 1876, one of two sons of Robert and Villa Marquis Strong. In 1888, when he was twelve, the family moved to Pasadena, California, where he attended Pasadena High School, graduating in 1895. He attended Stanford University, and in 1899 received his degree as a mining and civil engineer, the career he followed throughout his active professional life. While at Stanford, he was known as "Doc" because among his friends including Herbert Hoover and Ralph Arnold, he was the only one who did not get a doctorate (French, 1963). He became interested in conchology from his association with Senator Delos Arnold, with whom he did some collecting. Delos' son Ralph Arnold later utilized some of that material in his landmark study of San Pedro paleontology (E. M. Chace, 1952).

During his early professional life Strong worked in Death Valley and other parts of southern California (E. M. Chace, 1952). In Owens Valley, Inyo County, he was County Surveyor, chief engineer of the Cerro Gordo Mine and also surveyed the Searles Lake potash deposits, which were important during World War I (French, 1963).

By 1911, he had married and moved his wife, son and daughter to Los Angeles. He was a consulting engineer for many years specializing in projects in mining and petroleum, with an office at 215 W. 5<sup>th</sup> St. Room 1212, Los Angeles 13 (French, 1963). The world-wide Spanish Flu Epidemic of 1918, during which 675,000 died in the United States alone (Natural Living Magazine), took the lives of Strong's wife and young son. As a result of this tragic event, he moved with his surviving child, daughter Marion, to live with his mother (French, 1963).

Strong continued collecting shells and came to be a devoted student of malacology. He joined the Conchological Club of Southern California (CCSC) in 1920 and was first elected its president in 1927, the first of several times he so served.

Ruth French (1963) wrote that he began meeting at the home of her parents Elsie and Emery Chace along with Allyn Smith, George Willett, and Captain White. She added that Strong was a great storyteller, often regaling the group on camping trips with his amusing yarns. One story suggested that on one of Strong's trips a "desert fox ... carried off the last piece of soap in the surveying camp so the men couldn't shave, I



Figure 1. A.M. Strong from a group photo taken in 1948 at a malacological meeting. Courtesy of the Santa Barbara Museum of Natural History.

<sup>1</sup>Mailing address: 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA. E-mail: cmhertz@pacbell.net



think that was when he found out how comfortable a beard could be — certainly, I never saw him without one” (Figure 2).

The unpublished notebooks of Emery P. and Elsie M. Chace and their 1967 *Conchological Reminiscences* describe many collecting trips with Strong in central and southern California from 1922 through 1929:

– Mar. 20, 1925 — “Tide. -0.8 at 12.57 p.m. Peggy and I worked with A. M. Strong on Rocks just outside of Breakwater at Pt. Fermin. Took very little - 2 Black abalones. - 4 *Adula falcata* - 1 *Odostome subturrita* - few *Seila montereyensis* took only 1 chiton (*Callistochiton palmulatus*) altogether a punk day...”

– April 9, 10, 1926 “Elsie [Chace] out with Strong and White at Newport. 1 [*Pteropurpura trialatus*] on rocks lower end of Bay.”

– AMS June 27, 1929 Collected with Chaces at Pebble Beach “because we knew of no other place.”

Strong retired to 320½ Amade, Balboa Island, California, where he lived until his death (E. M. Chace, 1952). He devoted himself to his hobby. “By the time he retired from business Mr. Strong was widely recognized as one of the best authorities on Pacific Coast shells and with more time he undertook the classification of the shells collected by several scientific expeditions to the west coast of Central and South America and alone or in collaboration with one or more of his associates, he published a number of valuable papers on conchology” (French, 1963). He “acquired the reputation of being an exceptionally good systematist” (Fletcher, ca 1973). He classified by himself and with Leo G. Hertlein and others, mollusks collected by many scientific expeditions to the Panamic Province (though I find no evidence that he went on any of the trips) – Expeditions of California Academy of Sciences to the Gulf of California in 1921, to Guadalupe Island, to the Revillagigedos and Tres Marias in 1925; the Allan Hancock Expedition to the Galapagos Islands, 1931-1932; the Templeton Crocker Expedition of the CAS in 1932 off the west coast of Central America to Acapulco, Mexico, and the Galapagos Islands and the 1941 “Askoy” Expedition. He published over 25 papers and keys on mollusks as well as collaborating with others. His collaborators included Fred Baker, Ulysses S. Grant, IV, G Dallas Hanna, Leo G. Hertlein and Herbert N. Lowe.



Figure 2. A.M. Strong, from a photo taken by D .R. Shasky.

In 1922-23, with the cooperation of the members of the CCSC, Strong compiled an annotated list of the shells of Los Angeles and Orange counties. It was on 6 x 9½ looseleaf pages and two carbon copies were made. “I have a copy of that list and there are copies in the San Diego Society of Natural History library and there is a copy at the Santa Barbara Museum of Natural History” (E. P. Chace & E. M. Chace, 1967). In answer to a written query, J.Q. Burch wrote, “Mr. Strong’s notebook has never been published but his work is being published regularly in several established journals” (J.Q. Burch, 1946). In an unpublished letter to Joyce Gemmell in April 1980, Dr. A. Myra Keen wrote, “When I first came into malacology in the 1930s, A. M. Strong was the specialist on these [small mollusks], and we always sent our puzzles to him. After he was gone we had to work things out for ourselves, and only a few of us had the patience to carry on with the small stuff.”

Between December 1945 and October 1949, Strong contributed various keys, comments, distributional lists and species lists to the *Minutes of the Conchological Club of Southern California*, including their *Distributional Lists*. [The years, issues and page numbers of these can be found under the bibliography of Strong's work herein.] Most of these contributions were headed by a sentence including the words, "from Mr. A. M. Strong's notebook." A set of Strong's three notebooks is housed in the archives of the Research Library of the San Diego Natural History Museum. The notebooks were never published as a unit but parts were published in the *Minutes of the Conchological Club of*

*Southern California* (J. Q. Burch, ed., 1946).

Strong died at Balboa, California in 1951 and was survived by his daughter, Mrs. Marion Strong Clark, and three grandchildren (Brookshire, 1971). He had been a member of the American Institute of Mining and Metallurgical Engineers, American Malacological Union, and its Pacific Division, California Academy of Sciences, Conchological Club of Southern California, San Diego Society of Natural History and the Southern California Academy of Sciences. The largest part of his mollusk collection is in the San Diego Natural History Museum (Brookshire, 1971 [from personal files of the Chaces]).

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- 1930a. Some rissoid Mollusca from the Gulf of California. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 19(4): 23-40, pl. 1, 4 text figs. (15 July).
- 1930b. Some Mollusca of the family Epitoniidae from the Gulf of California. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 19(5): 41-56, pls. 2, 3 (15 July).
- 1938a. Some Mollusca of the families Cerithiopsidae, Cerithiidae and Cyclostrematidae from the Gulf of California and adjacent waters. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 23(15): 217-244, pls. 17-23 (24 May).
- 1938b. Columbelloidea from western Mexico. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 23(16): 245-254, pl. 24 (24 May).

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- 1943. Eastern Pacific Expeditions of the New York Zoological Society. XXXII. Mollusks from the west coast of Mexico and Central America. Part II. New York Zoological Society, *Zoologica* 28(3): 149-168, pl. 1 (6 December).
- 1945. Changes in the nomenclature of two West American marine bivalve mollusks. *The Nautilus* 58(3): 75 (19 February).
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- 1947. Eastern Pacific Expeditions of the New York Zoological Society. XXXVI. Mollusks from the west coast of Mexico and Central America. Part V. New York Zoological Society, *Zoologica* 31(4): 129-150, pl. 1 (21 February).
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- 1948b. Note on West American species of *Condylocardia*. *The Nautilus* 61(3): 106 (January).
- 1948c. Descriptions of a new species of *Trophon* from the Gulf of California. *Bulletin of the Southern California Academy of Science* 46(2) [for May-August 1947]: 79-80, 1 pl. (5 February 1948).
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1924. Notes on the *Donax* of California. *The Nautilus* 37(3): 81-84 (15 January).
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1928. VI. West American Mollusca of the genus *Phasianella*. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 17(6): 187-203, pl. 10 (22 June).
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1938. New species of west American shells. *Proceedings of the California Academy of Sciences*, 4<sup>th</sup> series, 23(14): 203-216, pls. 15, 16 (24 May).
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- 19-- [Three unpublished notebooks (two on gastropods, one on "pelecypods") by Strong. Pelecypod notebook with title "Pelecypoda Pt. Conception to Panama," the other two are "Gastropoda - No. 1. Pt. Conception to Panama. [Original label of #2, worn off].
- Strong A.M. & Elsie M. Chace**
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- Between December 1945 and October 1949, Strong contributed various keys, comments, distributional lists and species lists to the *Minutes of the Conchological Club of Southern California*, including their *Distributional Lists*. The years, issues and page numbers of these follow. Most of these contributions were headed by a sentence including the words, "from Mr. A.M. Strong's notebook."
- 1942-1946. *Minutes of the Conchological Club of Southern California*, John Q. Burch, editor.
- 1942 #16: 4-6. Notes on Cerithiidae. [published after talk presented to Club].
- 1943 #30: 1. Columbelloidea. Outline of talk given 11/43.
- #39: 10-17. Paper published after being read to the club dealing with the genera, subgenera and species of *Cardites* from the west coast [of California].
- #47: 2-4. Key to the principal genera of microscopic gastropods of the West Coast of North America. [Reprinted from CCSC 1934.]
- 11-12. Acteocinidae. [Letter on the family by Strong.]
- 16-17. Acteocinidae. Key to species "in the southern fauna."
- 19-20. *Volvulella*. Key to species from the southern fauna.
- 24-25. *Cylichna*. Key to species from Pt. Conception south [including] the southern fauna.
- #48: 12-14. Ellobiidae. Key and list of some species of the southern fauna.
- 19-27. Terebridae. Key and list of species of the entire west coast.
- #49: 2-15. Cancellariidae. Genus, subgenus and section names mentioned in west coast records and key to the genera.
24. Marginellidae. Key to genera and species.



- 28, 29. Mitridae. Key and list of west coast species.
- #50: 3-8. Fascioliariidae. Key to genera and list of species in the southern fauna.
12. *Cantharus*. List of species in the southern fauna.
27. *Colubraria*. *Ibid*.
29. *Engina* and *Caducifer*. List of species from the entire coast.
- #51: 3-5. Nassariidae. Key and list of species.
- 10-30. Columbelloidae. Key to genera and list of species.
- 37-42. Muricidae. Key to genera and list of species.
- 51-53. *Ocenebra*. Adaptation of key and list of species.
- 60-62. *Trophon*. Key and list of species.
- #52: 6-8. "Thaisidae". Key and list of species.
- 13-14. *Coralliophila*. *Ibid*.
- 15-27. Epitoniidae. Key to genera, subgenera and list of species.
- #53: 6-8. *Balcis*. Key and list of species.
- 15-16. *Strombiformis*. *Ibid*.
- 17-18. *Niso*. *Ibid*.
- 21-22. *Neosimnia*. *Ibid*.
- 25-26. Cypraeidae. Keys and list of species.
- 28-29. *Trivia*. Key and list of species.
- 29-30. *Erato*. Two keys and list of species.
- #54: 1-2. Architectonicidae, Modulidae, Planaxidae. Keys and lists of species from the southern fauna.
3. Bursidae. Key and list from the southern fauna.
- 4-5. Strombidae, Ficidae, Tonnidae [includes Cassidae]. Keys and lists of species from the southern fauna.
- 6-7. Cymatiidae. Key and list of species.
- 9-11. *Triphora*. Key and list of species.
- 12-14. Cerithiopsidae. Keys and list of species.
- 22-23, 27-29. Cerithiidae. Genera, subgenera, key and list of species.
- 36-40. Caecidae. Keys and list of species.
45. Turritellidae. Key and list of species.
- #55: 10-11. *Littorina*. Key and list of species.
- 17-18. Fossaridae. Keys and lists of species.
19. Litiopidae. Comments.
- 22-25. *Barleeia*. Comments on the group and distribution list.
26. *Amphithalamus*. Comments and key.
- 29-30. *Alvania*. Key to species.
- #56: 2-4. *Rissoina*. Key and distribution records.
- 4-7. Comments on *Rissoina* species.
- 10-11. *Hipponix*. Key and notes.
12. *Crepidula*. List of species and distributions.
- 19-21. *Crucibulum*. List of species and notes.
- 23-33. Naticidae. List and keys.
34. "Vanikoridae" Species listed "from the south."
- 34-35. Acmaeidae. Genera and species "from the southern fauna."
- #57: 17. *Phasianella*. List of species.
- 20-21. Turbinidae. Keys and notes.
- 24-25. Liotidae. List of species and keys.
- 27-33. Trochidae. List of species and keys.
- #58: 12-18. Vitrinellidae. List of species and keys.
- 24-27. Fissurellidae. Key from Strong notebook.
- #61: 2-16. Pyramidellidae. Keys to genera and subgenera.
- #62: 2-4. Turridae. Partial key to genera and subgenera (northern and deepwater shells omitted).
- 32-52. Turridae. Keys, data and list of species.
- 1944-1946. Distributional List of the West American Marine Mollusks from San Diego, California to the Polar Sea. Parts I [Pelecypoda: nos. 33-45, Mar. 1944-Feb. 1945] & II [Gastropoda: nos. 46-63, Mar. 1945-Sept. 1946], from the Minutes of the Conchological Club of Southern California. [Individual articles listed at the end of the bibliography.]
- 1945a. Nassariidae. Minutes of the Conchological Club of Southern California 51: 3-5 (August).
- 1945b. Columbelloidae [Keys]. *Ibid* 51:10-29 (August).
- 1945c. Epitoniidae [Keys]. *Ibid* 52:15-26 (September).
- ???. Key to the principal genera of microscopic gastropods of the west coast of North America. Conchological Club of Southern California, 2 pages, unpaginated (no date) [citation from Minutes CCSC 112:2 (Aug. 1951)].
- [A. M. Strong's Notebook "West Coast Turrids" undated]
- Key to Genera and Subgenera of Turridae as defined in Grant and Gale" (pp. 1&2).
  - Kiener, Famille des Canaliferes, Vol. 1 (1 un-numbered page on genus *Pleurotoma*).

- "Reeve's Monograph of *Pleurotoma* by J.B. le B. Tomlin" (1 unnumbered page on *Pleurotoma* and *Mangilia*).
- Listing of the genera and species in Turridae – 30 unnumbered pages listing species by genera and

- giving type locality and original literature source.
- "Unplaced species" – 3 unnumbered pages listing by species with genera in parentheses. Type locality, and literature source.
- Index to species – 5 unnumbered pages listing genera in parentheses.

### Species Named in Honor of A. M. Strong

*Collisella strongiana* (Hertlein, 1958), now in genus *Lottia* by Lindberg, 1986.

*Epitonium (Nitidiscala) strongi* Lowe, 1932, homonym of *E. strongi* Bartsch, 1928.

*Epitonium strongianum* Lowe, 1932, new name for *Epitonium (Nitidiscala) strongi* Lowe, 1932 = *E. (Nitidiscala) statuminatum* (Sowerby, 1844) by Keen, 1971; DuShane, 1974.

*Lydiphnis strongi* Pilsbry & Olsson, 1952 (Figure 3).

*Engina strongi* Pilsbry & Lowe, 1932 (Figure 4).

*Anachis strongi* Bartsch, 1928 = *Parvanachis milium* (Dall, 1916), by Skoglund, 1986.

*Cancellaria (Agatrix) strongi* Shasky, 1961, now

*Agatrix strongi* by Petit, 1976 (Figure 5).

*Odostomia (Evalea) strongi* Bartsch, 1927.

*Turbonilla (Pyrgolampros) strongi* Willett, 1931.

*Haminoea strongi* Baker & Hanna, 1927 = *Haminoea virescens* (G. B. Sowerby I, 1833), by Keen, 1971.

*Pleurobranchus strongi* MacFarland, 1966, now *Berthella strongi*.

*Spisula strongi* T.A. Burch, 1945 = *Simomactra planulata* (Conrad, 1837) by Coan, Valentich Scott & Bernard, 2000.

*Mangelia (Taranis) strongi* Arnold, 1903 (Pleistocene), now *Pseudotaranis strongi* by McLean, 1996.

*Gyrineum strongi* Jordan, 1936 (Pleistocene).

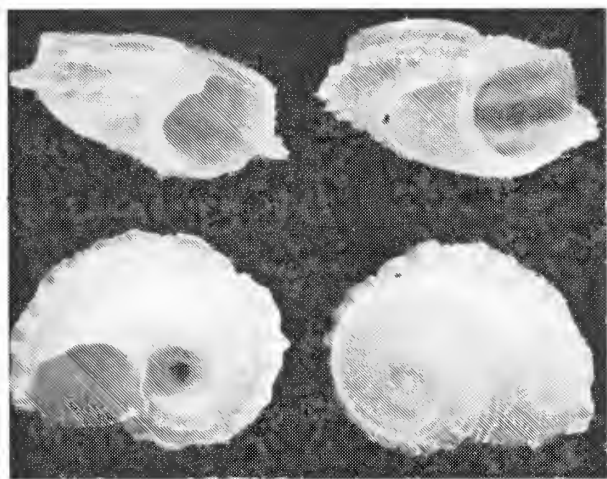


Figure 3. *Lydiphnis strongi* Pilsbry & Olsson, 1952. Four views of same shell. México. Leg. James McLean, 1973. Photo: Bert Draper. Courtesy of Carol Skoglund.

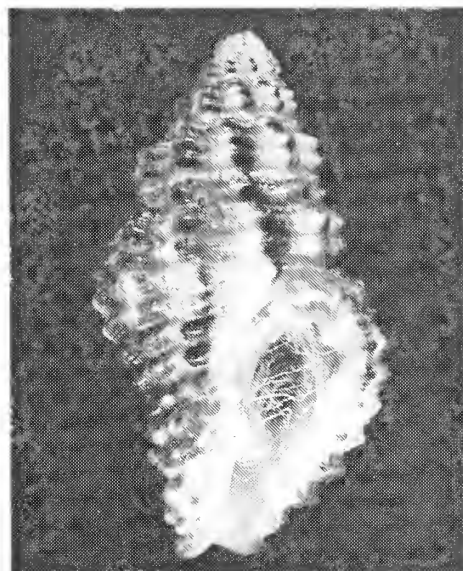
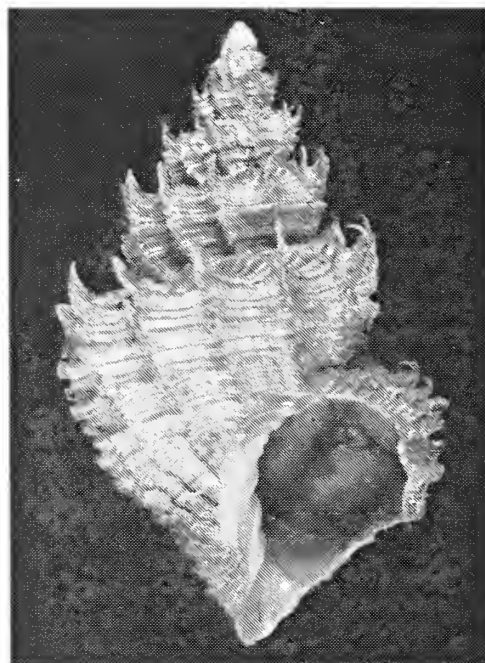


Figure 4. *Engina strongi* Pilsbry & Lowe, 1932. Length 16.7 mm. Leg. Larry Buck. Off Pt. Loma, California in 30 m. Photo: David K. Mulliner.

**Abbreviations used:** AMNH – American Museum of Natural History; CAS – California Academy of Sciences; CASIZ -- California Academy of Sciences, Invertebrate Zoology; CASGTC – former number of the CAS Geology Type Collection; CCSC – Conchological Club of Southern California; LACM – Natural History Museum of Los Angeles County; PCCSC – Proceedings of the Conchological Club of Southern California; SBMNH – Santa Barbara Museum of Natural History; SDNHM – San Diego Natural History Museum; UCMF – University of California Museum of Paleontology; USNM – National Museum of Natural History; fig(s) – figure(s); H – holotype; P – paratype; spec. – specimen; Id – Identified by; V – voucher.

Figure 5. *Agatrix strongi* (Shasky, 1961). Length: 17.2 mm. Isla de Coiba, Golfo de Chiriquí, Panamá, in 100-137 m. Leg. Kirstie L. Kaiser, 28 April 2000. Photo: David K. Mulliner.→



#### Taxa Described by A. M. Strong

**Format:** Each taxon described by Strong, alone and with co-authors, is listed in its group, alphabetically by species in its original orthography with author, date and original citation. Primary type material is entered with museum numbers, amount of specimens in the lot and type localities. If there is an older museum number for a taxon, it is listed in parentheses after the number

#### Gastropoda

*academica*, *Turbonilla* (*Cingulina*) Strong & Hertlein, 1939, 2(12): 205, pl. 19, fig. 14

H: CASIZ 65652 (CAS 748)

P: CASIZ 66835, 3 spec.

P: SDNHM 41240 (3703, 3704), 2 spec., donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comments:** *Cingulina* A. Adams, 1860, raised to a genus and moved from *Turbonilla* by Abbott, 1974. Synonym of *Cingulina urdeneta* (Bartsch, 1917) (Koch, 1993).

*Acanthotrophon* Hertlein & Strong, 1951, 36(2): 86

**Type species:** *Trophon* (*Acanthotrophon*) *sorenseni* Hertlein & Strong, 1951: 86.

*aepynota planicosta*, *Odostomia* (*Miralda*) Baker, Hanna Strong, 1928: 17(7): 237, pl. 12, fig. 14

H: CASIZ 66094 (CAS 4048)

in current usage. Occasionally voucher material is included when it is so listed by its institution. When appropriate, comments are included. In addition to other reference material, Skoglund (2002) was consulted extensively for updates on the Gastropoda as were Coan & Scott (1997) for the Bivalvia. For a listing of dredging stations and data for the *Zaca*, see Beebe (1937).

P: CASIZ 66095 (CAS 4049-4053), 5 spec.

**Type locality:** Cabo San Lucas, Baja California Sur, México.

**Comment:** *Miralda* A. Adams, 1864, raised to a genus (Vaught, 1989).

*alarconi*, *Rissoina* Hertlein & Strong, 1951, 36(2): 109, pl. 8, fig. 12

H: CASIZ 65110

P: CASIZ 65113, 2 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

*alarconi*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 79, pl. 12, fig. 5

H: CASIZ 65520 (CAS 9471)

P: CASIZ 65521 (CAS 9472), 1 spec.

**Type locality:** Bahía Concepción, Golfo de California,

México. Leg. Fred Baker, 1921.

**P:** CASIZ 65522 (CAS 9473), 1 spec.

**Collecting data:** Bahía San Luis Gonzaga, Golfo de California, México. Leg. Fred Baker, 1921.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*Alleorus* Strong, 1938, 23(14): 212

**Type species:** *Alleorus deprellus*, Strong, 1938.

*allyniana*, *Cymatosyrinx* Hertlein & Strong, 1951, 36(2): 77, pl. 1, fig. 7

**H:** CASIZ 65102

**P:** CASIZ 65109, 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°32'00"N, 109°27'00"W), dredged in 55 fm (100 m) in mud. Leg. Templeton Crocker Expedition, 19 Apr. 1936.

*amandi*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 202-203, pl. 19, fig. 7

**H:** CASIZ 65648 (CAS 749)

**P:** LACM 1345, 1 dry spec.

**Type locality:** Bahía Honda, Isla Coiba, Veraguas, Panamá, in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*amiriana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 94, pl. 6, fig. 7

**H:** CASIZ 65010

**P:** CASIZ 65011, 1 spec.

**Type locality:** Off Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific Zaca Expedition, 20 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*amortajadensis*, *Turbonilla* (*Chemnitzia*) Baker, Hanna & Strong, 1928, 17(7): 209, pl. 11, fig. 2

**H:** CASIZ 66069 (CAS 4001)

**Type locality:** Isla San José, Bahía Amortajada, Golfo de California, México, in 2-3 fm (4-6 m). Leg. Fred Baker, 1921.

*arenaense*, *Bittium* (*Lirobittium*) Hertlein & Strong, 1951, 36(2): 107, pl. 7 fig. 8.

**H:** CASIZ 65499

**P:** CASIZ 64517, 4 spec.

**P:** CASIZ 65500, 4 spec.

**P:** SDNHM 12260 (1577-1580), 4 spec., Id and donor: Strong

**Type locality:** Arena Bank, Golfo de California, México [23°28'30"N, 109°25'00"W], in 45 fm (82 m), mud. Leg. Templeton Crocker Expedition, 30 Apr. 1936.

*arenensis*, *Cymatosyrinx* Hertlein & Strong, 1951, 36(2): 76-77, pl. 1, fig. 17

**H:** CASIZ 65104

**P:** CASIZ 65122, 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°28'30"N, 109°25'00"W), dredged in 45 fm (82 m) in mud. Leg. Templeton Crocker Expedition, 30 Apr. 1936.

**P:** CASIZ 65133, 1 spec.

**Type locality:** Gorda Banks, Golfo de California, México (23°01.00'N, 109°27'30"W), 45 fm (82 m) in sand and calcareous algae. Leg. Templeton Crocker Expedition, 3 May 1936.

**P:** CASIZ 64505, 1 spec.

**P:** SDNHM 12253 (1566), 1 spec., donor: Leo G. Hertlein

**Type locality:** near Arena Bank, Golfo de California, México (23°32'00"N, 109°27'00"W), dredged in 55 fm (100 m) in mud. Leg. Templeton Crocker Expedition, 19 Apr. 1936.

**Comment:** In the genus *Elaeocyma* Dall, 1918 (McLean, in Keen, 1971).

*aripana*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 81-82, pl. 11, fig. 5

**H:** CASIZ 65443 (CAS 9478)

**P:** CASIZ 65444 (CAS 9479, 9480), 2 spec.

**Type locality:** Puerto Escondido, Golfo de California, México. Leg. Fred Baker, 1921.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*armstrongi*, *Lioglyphostoma* Hertlein & Strong, 1955, 107(2): 230-231, pl. 3, fig. 12

**H:** AMNH 73442

**Type locality:** Guayabo, Chiquito, Panamá, dredged from center of bay to entrance in 25-64 m, gray mud bottom. "Askoy" Expedition, AMNH, 4 March 1941.

**Comments:** Original description stated "only one specimen found." Synonym of *Glyphostoma neglecta* (Hinds, 1843) (McLean, in Keen, 1971).

*asaedai*, *Cymatosyrinx* Hertlein & Strong, 1951, 36(2): 78, pl. 1, fig. 4

**H:** CASIZ 65111

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°30'30"N, 109°26'00"W), dredged in 45 fm (82 m) in mud and *Arca* conglomerate. Leg. Templeton Crocker Expedition, 3 Apr. 1936.

**Comment:** In the genus *Imaclava* Bartsch, 1944 (McLean, in Keen, 1971).

*asuncionis*, *Turbonilla* (*Strioturbonilla*) Strong, 1949: 48(2): 76, pl. 12, fig. 6

**H:** CASIZ 65445 (CAS 9468)

**P:** CASIZ 65446 (CAS 9469, 99470), 2 spec.

**P:** SDNHM 40326 (3392, 3393), 2 spec., donor: Strong

**Type locality:** Isla Asunción, Baja California Sur, México. Leg. L.G. Hertlein, 23 Feb. 1932.

*audax*, *Odostomia* (*Chrysallida*) Baker, Hanna & Strong, 1928, 17(7): 17(7): 230-231, pl. 12, fig. 7

**H:** CASIZ 66088 (CAS 4038)

**P:** CASIZ 66089 (CAS 4039), 1 spec.

**P:** SDNHM 40478 (1839), 1 spec. Id and donor: Strong

**Type locality:** Cabo San Lucas, Baja California Sur,



México. Leg. G D. Hanna & E.K. Jordan, 1925.

**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).

*axeliana*, *Rissoina* Hertlein & Strong, 1951, 36(2): 109, pl. 3, fig. 6

**H:** CASIZ 65085

**P:** CASIZ 65084, 1 spec.

**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** Genus changed to *Zebina* H. Adams & A. Adams, 1854 (Ponder, 1985a).

*ayamana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 96, pl. 6, fig. 14

**H:** CASIZ 65037

**P:** CASIZ 65044, 2 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m) in sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*azteca* *Odostomia* (*Miralda*) Strong & Hertlein, 1939, 2(12): 207-208, pl. 18, fig. 10

**H:** CASIZ 65687 (CAS 734)

**P:** CASIZ 85639, 17 spec.

**P:** LACM 1348, 1 dry spec.

**P:** SDNHM 40479 (3710-3715), 6 spec., donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.

**Comment:** *Miralda* A. Adams, 1864, raised to a genus (Vaught, 1989).

*azteca*, *Turbonilla* (*Pyrgiscus*) Baker, Hanna & Strong, 1928, 17(7): 222-223, pl. 11, fig. 14

**H:** CASIZ 66079 (CAS 4017)

**P:** CASIZ 66080 (CAS 4018-4020), 3 spec.

**P:** SDNHM 40391 (1838), one spec., donor: Strong

**Type locality:** Bahía San Luis Gonzaga, Baja California, México, in 4 fm (7 m). Leg. Fred Baker, 1921.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*bahiahondaense*, *Caecum* Strong & Hertlein, 1939, 2(12): 219 & 224, pl. 20, fig. 10

**H:** CASIZ 65657 (CAS 708)

**V:** CASIZ one voucher lot, no number given

**P:** SDNHM 40383 (3753-3772), 20 spec.

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.

*bailii*, *Circulus* Hertlein & Strong, 1951, 36(2): 111, pl. 9, figs. 2, 6, 9

**H:** CASIZ 65126

**P:** CASIZ 65127, 3 spec.

**Type locality:** Corinto, Chinandega, Nicaragua, in beach

drift, Eastern Pacific *Zaca* Expedition, 1937 or 1938.

**Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (Hertz, Myers & Gemmell, 1992).

*bakeri*, *Aspella* Hertlein & Strong, 1951, 50(2): 79, pl. 26, figs. 1, 2

**H:** CASIZ 64935 (CAS 5893)

**P:** CASIZ 64936 (CAS 5894), 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Agua Verde, Golfo de California, México. Leg. F. Baker, 1921.

**Comment:** In the genus *Dermomurex* Monterosato, 1890 (Vokes, 1975).

*bakeri*, *Circulus* Strong & Hertlein, 1939, 2(12): 240-241, pl. 21, figs. 14, 15; pl. 22, fig. 1

**H:** CASIZ 65672 (CAS 713)

**P:** SDNHM 41359 (3857-3859), 3 spec.

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.

**Comment:** In the genus *Solariorbis* Conrad, 1865 (DuShane in Keen, 1971).

*bakeri*, *Rissoella* Strong, 1938, 23(14): 211-212, pl. 15, fig. 5

**H:** CASIZ 65898 (CAS 5821)

**Type locality:** Isla Guadalupe, Baja California, México, dredged in 9-15 fm (16-27 m). Leg. G D. Hanna, E. K. Jordan & J. R. Slevin.

*balboai*, *Liotia* Strong & Hertlein, 1939, 2(12): 236-237, pl. 21, figs. 3, 5, 6

**H:** CASIZ 65678 (CAS 728)

**P:** SDNHM 40369 (3817-3830), 14 spec., donor: Strong

**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 1 February 1932.

**Comment:** In the genus *Arene* H. Adams & A. Adams, 1854 (McLean in Keen, 1971).

*bartschi*, *Conus* Hanna & Strong, 1949, 4<sup>th</sup> ser, 26(9): 271-272, pl. 5, fig. 5

**H:** CASIZ 65602 (CAS 9296)

**V:** CASIZ one voucher lot, no number given

**Type locality:** Cabo San Lucas, Baja California Sur, México, dredged in 20-25 fm (37-46 m). Leg. Templeton Crocker Expedition, 6 Aug. 1932.

*bartschi*, *Cyclostrema* Strong & Hertlein, 1939, 2(12): 240, pl. 21, figs. 12, 13, 16 [*non* Mansfield, 1930]

**H:** CASIZ 65673 (CAS 715)

**P:** SDNHM 41278 (3834-3839), 6 spec., 1d and donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (5-16 m). Leg. L.G. Hertlein, Allan Hancock Pacific Expedition, 1931-1932.

**Comment:** *Cyclostremiscus veleronis* Strong & Hertlein, 1947 (61(1): 31) is a new name for *C. bartschi*.

*bartschi*, *Eulimostraca* Strong & Hertlein, 1937, 22(6): 170-171, pl. 35, fig. 7

- H:** CASIZ 85623 (CAS 6986)  
**Type locality:** 5 mi W of Mazatlán, Sinaloa, México (23°12'00"N, 106°29'00"W), dredged in 12 fm (22 m). Leg. Templeton Crocker Expedition, 2 August 1932.  
**Comment:** Probably belongs in *Microeulima* Warén, 1992 (Warén, 1992).
- bartonella*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 203, pl. 19, fig. 8  
**H:** CASIZ 65649 (CAS 752)  
**P:** LACM 1346, 1 dry spec.  
**Type locality:** Bahía Honda, Isla Coiba, Veraguas, Panamá, in 3-9 fm (5-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- beebei*, *Fissurella* Hertlein & Strong, 1951, 36(2): 113, pl. 10, figs. 3-5  
**H:** CASIZ 65120  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Gorda Banks, Golfo de California, México (23°00'00"N, 109°28'00"W), dredged in 58 fm (106 m) in sand Leg. Templeton Crocker Expedition, 21 April 1936.  
**Comment:** Berry (1954) named *Fissurella beebei* as the type species of the genus *Stromboli* (Berry, 1954).
- beebei*, *Trophon* (*Boreotrophon*) Hertlein & Strong, 1948: 79, 80, pl. 18, figs. 1, 2  
**H:** CASIZ 64365 (CAS 8334)  
**P:** CASIZ 66490 (8335, 8336 ex Stanford University), 2 spec.  
**P:** CASIZ 64366, 1 spec.  
**P:** CASIZ 64367, 1 spec.  
**P:** CASIZ 66489, 1 spec.  
**Type locality:** Gorda Banks, Golfo de California, México (23°01'00"-23°02'00"N, 109°27'30"-109°29'00"W), dredged in 50-90 fm (91-165 m) in sand and calcareous algae. Leg. Templeton Crocker Expedition, 23 Apr. 1936.  
**P:** SDNHM 12300 (1554), 1 spec., donor: Strong  
**Type locality:** Gorda Banks, Golfo de California, México (23°01'N, 109°28'30"W), in 50 fm (137 m) in sand. Leg. Templeton Crocker Expedition, 27 Aug. 1932.  
**P:** SDNHM 41545, 1 spec., donor: Strong  
**Type locality:** Same locality as above (23°02'N, 109°29'W, dredged in 80 fm (165 m), Leg. Templeton Crocker Expedition, 3 May 1936.  
**Comment:** Transferred from genus *Trophon* to *Forreria*, Jousseume, 1880 (Vokes, 1988).
- beltiana*, *Turbonilla* (*Careliopsis*) Hertlein & Strong, 1951, 36(2): 91-92, pl. 6, fig. 3  
**H:** CASIZ 65013  
**Type locality:** Near Corinto, Chinandega, Nicaragua, in beach drift.  
**Comment:** *Careliopsis* Mörch, 1875, raised to a genus (Odé, 1994a).
- berryi*, *Rissoina* Baker, Hanna & Strong, 1930, 19(4): 35-36, pl. 1, fig. 3  
**H:** CASIZ 66057 (CAS 4608)  
**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. "E. C. Johnston of the U.S.S. *Albatross* about 1914."  
**Comments:** Synonym of *Acirsa menesthoides* Carpenter, 1864 (DuShane, 1974). Genus currently *Couthouyella* Bartsch, 1909 (Weil, Brown & Neville, 1999).
- biolleyi*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 98-99, pl. 3, fig. 2  
**H:** CASIZ 65050  
**P:** CASIZ 65038, 4 spec.  
**Type locality:** Off Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Eastern Pacific *Zaca* Expedition. Leg. R/V *Zaca*, 20 Jan. 1938.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- bonita*, *Calliostoma* Strong, Hanna & Hertlein, 1933, 21(10): 121, pl. 5, figs. 5, 6  
**H:** CASIZ 66010 (CAS 6044)  
**V:** CASIZ one voucher lot, no number given  
**P:** SDNHM 3978, 3 spec., donor: Strong.  
**Type locality:** Bahía Acapulco, Guerrero, México. Leg. Templeton Crocker, Templeton Crocker Expedition, 4 April 1932.
- bonita*, *Strombina* Strong & Hertlein, 1937, 22(6): 169-170, pl. 35, fig. 9  
**H:** CASIZ 36683 (CAS 6984)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** off Cabo San Lucas, Baja California Sur, México, dredged in 20-25 fm (37-46 m). Leg. Templeton Crocker Expedition, 6 August 1932.  
**Comment:** Jung (1989) stated it isn't a *Strombina* but gave no definite generic assignment.
- bramkampi*, *Conus* Hanna & Strong, 1949, 26(9): 314, pl. 8, fig. 14  
**H:** UCMP 34199  
**Type locality:** "south side of Carrizo Mountain, Imperial County, California; Pliocene; in a small canyon, about 3/8 mi. E of mouth of Alverson Canyon in small draws cut in basal conglomerate on west side of canyon, 100-120 yards from its mouth (Bramkamp)" (University of California Museum of Paleontology, collected from Loc. A-1269 (U.C.). Leg. R.A. Bramkamp.
- bristolae*, *Calotrophon* Hertlein & Strong, 1951, 36(2): 87-88, pl. 2, fig. 2  
**H:** CASIZ 65501  
**P:** CASIZ 64520, 1 spec.  
**P:** CASIZ 65502, 2 spec.  
**V:** CASIZ one voucher lot, no number given  
**P:** SDNHM 12297 (1576), 1 spec., donor: Leo G. Hertlein  
**Type locality:** Gorda Banks, Golfo de California, México (23°01'00"N, 109°29'00"W), in 60 fm (109 m) on sand and calcareous algae. Leg. Templeton Crocker and 3 May 1936, and Eastern Pacific *Zac* Expeditions,

13 Nov. 1937.

**Comment:** As a synonym of *Calotrophon turritus* (Dall, 1919) (Keen, 1971).

*bristolae*, *Cerithiopsis* (*Cerithiopsida*) Baker, Hanna & Strong, 1938, 23(15): 219-220, pl. 19, fig. 4

**H:** CASIZ 65939 (CAS 5457)

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, June 1925.

*brujae*, *Crassispira* Hertlein & Strong, 1951, 36(2): 74, pl. 1, fig. 18

**H:** CASIZ 65492

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°29'00"N, 109°24'00"W), dredged in 45 fm (82 m) in mud and *Arca* conglomerates. Leg. Templeton Crocker Expedition, 20 Apr. 1936.

*burchi*, *Cytharella* Hertlein & Strong, 1951, 36(2): 79, pl. 1, fig. 6

**H:** CASIZ 65509

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°28'30"N, 109°25'00"W), dredged in 45 fm (82 m) in mud. Leg. Templeton Crocker Expedition, 30 Apr. 1936.

**Comment:** As a synonym of *Tenaturris verdensis* (Dall, 1919) (McLean in Keen, 1971).

*Calotrophon* Hertlein & Strong, 1951, 36(2): 87

**Type species:** *Calotrophon bristolae* Hertlein & Strong, 1951.

*caneloensis*, *Natica* Hertlein & Strong, 1955, 107(2): 287, pl. 2, figs. 13, 18

**H:** CASIZ 32847 (CAS 9891)

**Type locality:** Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica, on beach. Leg. Eastern Pacific *Zaca* Expedition, Jan. 1938.

**Comment:** Placed in subgenus *Naicarius* Duméril, 1806 (Marincovich, 1977).

*caneloensis*, *Odostomia* (*Besla*) Hertlein & Strong, 1951, 36(2): 102-103, pl. 7, fig. 3

**H:** CASIZ 65033

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m), sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** *Besla* Dall & Bartsch, 1904, raised to a genus (Odé, 1993).

*cassi*, *Cerithiopsis* (*Cerithiopsida*) Baker, Hanna & Strong, 1938, 23(15): 220-221, pl. 19, fig. 5

**H:** CASIZ 65941 (CAS 5458)

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, June 1925.

**V:** SDNHM 5323, 1 spec.

**Collecting data:** Isla Espiritu Santo, Golfo de California. same collectors as above, ex F. Baker Colln., donor: Baker Estate.

**Comments:** This voucher specimen listed under the

original description. As a synonym of *C. bristolae* Baker, Hanna & Strong, 1938 (J. Hertz, 2000).

*chacei*, *Crassispira* Hertlein & Strong, 1951, 36(2): 73-74, pl. 1, fig. 12

**H:** CASIZ 65486

**V:** CASIZ one voucher lot, no number given

**Type locality:** Gorda Banks, (23°01'00"N, 109°27'30"W), dredged in 45 fm (82 m) in sand and calcareous algae. Leg. Templeton Crocker Expedition, 22 Apr. 1936.

**P:** CASIZ 65487, 1 spec.

**Type locality:** Gorda Banks, Golfo de California, México (23°04'N, 109°30'30"W), dredged in 50-60 fm (91-109 m), muddy sand. Leg. Templeton Crocker Expedition, 22 Apr. 1936.

*chacei*, *Opalia* Strong, 1937, 51(1): 5-6, pl. 2, fig. 9

**H:** LACM 1045

**P:** SBMNH 34862, 3 spec.

**Type locality:** Crescent City, Mendocino County, California, Leg. E. P. & E. M. Chace.

**Comment:** Synonym of *Opalia borealis* (Lyell, 1842) (DuShane, 1979; Weil, Brown & Neville, 1999).

*chalcana*, *Turbonilla* (*Strioturbonilla*) Baker, Hanna & Strong, 1928, 17(7): 212-213, pl. 11, fig. 6

**H:** CASIZ 66071 (CAS 4005)

**P:** SDNHM 49097 (1835-1837), 3 spec., donor: Fred Baker

**Type locality:** Golfo de California, México. Leg. George D. Porter.

*chinandegana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 97, pl. 5, fig. 3

**H:** CASIZ 65046

**Type locality:** Corinto, Chinandega, Nicaragua, in beach drift. Eastern Pacific *Zaca* Expedition, 1937 or 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*chiquita*, *Hemitoma* Hertlein & Strong, 1951, 36(2): 113-114, pl. 10, figs. 2, 7, 10

**H:** CASIZ 65123

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), dredged in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** Synonym of *H. natlandi* Durham, 1950 (McLean in Keen, 1971).

*cholutecana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 97, pl. 5, fig. 3

**H:** CASIZ 65041

**P:** CASIZ 65049, 1 spec.

**Type locality:** Corinto, Chinandega, Nicaragua, beach drift. Eastern Pacific *Zaca* Expedition, 1937 or 1938.

**Comment:** Synonym of *Pyrgiscus mariana* (Bartsch, 1917) (Odé, 1996).

*ciguatanis*, *Odostomia* (*Menestho*) Strong, 1949: 48(2): 89, pl. 12, fig. 3

- H:** CASIZ 65455 (CAS 9492)  
**P:** CASIZ 65456 (CAS 9493, 9494), 2 spec.  
**Type locality:** Golfo de California "without definite location," México. Leg. Fred Baker, 1921.  
**Comment:** *Menestho* Möller, 1842, raised to a genus (Vaught, 1989).
- clarionensis*, *Turritella* Hertlein & Strong, 1951, 108, pl. 2, fig. 13  
**H:** CASIZ 65096  
**P:** CASIZ 65097, 2 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Isla Clarión, Islas Revillagigedo, México (18°19'00"N, 114°45'00"W), in 55 fm (100 m) on rock and coral bottom. Leg. Templeton Crocker Expedition, 12 May 1936.
- cochimana*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 82, pl. 12, fig. 4  
**H:** CASIZ 65447 (CAS 9481)  
**P:** CASIZ 65448 (CAS 9482, 9483), 2 spec.  
**Type locality:** Puerto Escondido, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- colima*, *Natica* Strong & Hertlein, 1937: 174, pl. 35, figs. 12, 13, 16  
**H:** CASIZ 65986 (CAS 6996)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Punta San Juan de Lima, 20 mi NW of Punta Telmo, 47 mi. SE of Manzanillo, Colima, México (18°33'00"N, 103°45'00"W), dredged in 52 fm (95 m) just offshore of Black Head. Leg. Templeton Crocker Expedition, 17 July 1932.  
**Comment:** Placed in subgenus *Naticarius* Duméril, 1806 (Marincovich, 1977).
- colimana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 94-95, pl. 6, fig. 5  
**H:** CASIZ 65006  
**Type locality:** Near Manzanillo, Colima, México (19°04'00"N, 104°22'00"W), in 30 fm (55 m) in gravelly sand. Leg. Eastern Pacific *Zaca* Expedition, 22 Nov. 1937.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- colimanum*, *Epitonium* (*Punctiscala*) Hertlein & Strong, 1951, 36(2): 90, pl. 3, fig. 14  
**H:** CASIZ 65090  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** near Manzanillo, Colima, México (19°04'00"N, 104°22'00"W), dredged in 30 fm (55 m) in gravelly sand. Leg. Eastern Pacific *Zaca* Expedition, 22 Nov. 1937.  
**Comment:** As *Opalia colimana* (DuShane, 1974).
- contrerasi*, *Odostomia* (*Chrysallida*) Baker, Hanna & Strong, 1928: 17(7): 231-232, pl. 12, fig. 13  
**H:** CASIZ 66090 (CAS 4040)  
**?P:** SDNHM 42506, 1 spec., ex Baker Collection  
**Type locality:** Golfo de California, México. Leg. George D. Porter.
- Comments:** Note in SDNHM 42056 card file states "possibly from type lot." Lot has F. Baker's blue cardboard label. Not currently in the SDNHM Type Collection. *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).
- contrerasiana*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 102, pl. 5, fig. 13  
**H:** CASIZ 65045  
**P:** CASIZ 65048, 2 spec.  
**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), gravelly sand, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- cooperi*, *Epitonium* (*Nitidiscala*) Strong, 1930, 6(7): 194, pl. 20, figs. 6a,b, 7, 8a,b [see also discussion p. 189]  
**H:** SDNHM 41195 (345)  
**P:** SDNHM 80763 (3386-3391), 6 spec.  
**Type locality:** San Pedro, California, Leg. and donor: Strong.  
**P:** USNM 46222  
**Collecting data:** Monterey, California.  
**Comments:** "labelled *E. indianorum tinctum* Cpr., Monterey, identified by Dall." As a synonym of *E. hindsi* (Carpenter, 1856) (DuShane, 1979; Weil, Brown & Neville, 1999). USNM 46222 paratype not located in the USNM collection (P. Greenhall, pers comm).
- corintoensis*, *Odostomia* (*Chrysallida*) Hertlein & Strong, 1951: 36(2): 104, pl. 8, fig. 11  
**H:** CASIZ 65024  
**Type locality:** Corinto, Chinandega, Nicaragua, in beach drift, 1937 or 1938.  
**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).
- corintonis*, *Balcis* (*Balcis*) Hertlein & Strong, 1951, 36(2): 90-91, pl. 6, fig. 1  
**H:** CASIZ 65496  
**P:** CASIZ 65497, 3 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m), in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 8 Jan. 1938.  
**Comment:** In the genus *Melanella* Bowdich, 1822 (Bouchet & Warén, 1986).
- corintonis*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 101, pl. 4, fig. 1  
**H:** CASIZ 65007  
**P:** CASIZ 65009, 2 spec.  
**Type locality:** Corinto, Chinandega, Nicaragua, beach drift. Leg. Eastern Pacific *Zaca* Expedition, 1937 or 1938.
- coronata hannana*, *Anachis* Hertlein & Strong, 1951, 22(16): 82, pl. 2, fig. 3 (new subspecies)  
**H:** CASIZ 65022  
**V:** CASIZ one voucher lot, no number given



**Type locality:** Cabo San Lucas, Baja California Sur, México, 1936-1938.

**Comment:** In the genus *Costoanachis* Sacco, 1890 (Radwin, 1974).

*costaricensis*, *Odostomia* (*Chrysallida*) Hertlein & Strong, 1951: 36(2): 103, pl. 7, fig. 9

**H:** CASIZ 65029

**P:** CASIZ 65028, 1 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W to 10°56'05"N, 85°49'25"W), in 12-15 fm (22-27 m), sandy and shelly mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).

*cowlesi*, *Turbonilla* (*Strioturbonilla*) Strong & Hertlein, 1939: 2(12): 196-197, pl. 19, fig. 3

**H:** CASIZ 65641 (CAS 750)

**P:** CASIZ 85642, 32 spec.

**P:** LACM 1342, 1 dry spec.

**P:** SDNHM 40485 (3695-3700), 6 spec., donor: Strong  
**Type locality:** Isla Coiba, Bahía Honda, Panamá, in 3-9 fm (5-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.

**P:** SDNHM 41004 (3683-3685), 3 spec.,

**Type locality:** Isla Taboga, Veraguas, Panamá. Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, donor: Strong.

*coyotensis*, *Turbonilla* (*Mormula*) Baker, Hanna & Strong, 1928, 17(7): 223-224, pl. 11, fig. 17

**H:** CASIZ 66081 (CAS 4023)

**P:** CASIZ 66082 (CAS 4024), 1 spec.

**Type locality:** Bahía Concepción, Bahía Coyote, Baja California Sur, México, in 2 fm (4 m). Leg. Fred Baker, 1921.

**P:** CASIZ 66083 (CAS 4025), 1 spec.

**Collecting data:** Bahía San Luis Gonzaga, Golfo de California, México, in 3 or 4 fm (6 or 7 m). Leg. Fred Baker, 1921.

*craneana*, *Elaeocyma* Hertlein & Strong, 1951, 36(2): 75, pl. 1, fig. 2

**H:** CASIZ 65015

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Honda, Veraguas, Panamá. Leg. Eastern Pacific *Zaca* Expedition, 1937-1938.

**Comment:** In the genus *Calliclava* McLean, 1971 (McLean in Keen, 1971).

*crickmayi*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 200-201, pl. 19, fig. 10

**H:** CASIZ 65646 (CAS 751)

**P:** CASIZ 85643, 2 spec.

**V:** SDNHM 40520, 2 spec., type locality, donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*Crockerella* Hertlein & Strong, 1951: 78

**Type species:** *Clathurella crystallina* Gabb, 1865.

*crockeri*, *Strombinoturris* Hertlein & Strong, 1951, 36(2): 84-85, pl. 1, fig. 9

**H:** CASIZ 65018

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°29'00"N, 109°23'30"W), dredged in 50 fm (91 m) in mud and *Arca* conglomerates. Leg. Templeton Crocker Expedition, 19, 30 Apr. 1936, 30 Jan. 1936.

**P:** CASIZ 85637, 2 spec.

**P:** CASIZ 65017, 1 spec.

**P:** CASIZ 64519, 1 spec.

**P:** SDNHM 12285 (1575), 1 spec., donor: Leo G. Hertlein

**Type locality:** Gorda Banks, Golfo de California, México (23°05'00"N, 109°30'00"W), in 40-45 fm (73-82 m) in muddy sand. Leg. Templeton Crocker Expedition, 22 Apr. 1936.

*deprellus*, *Alleorus* Strong, 1938, 23(14): 213, pl. 16, figs. 3-5

**H:** CASIZ 65901 (CAS 7075)

**P:** CASIZ 65900 (CAS 7076), 1 spec.

**V:** CASIZ one voucher lot of 1 spec., no number given

**Type locality:** Isla San José, Bahía Amortajada, Golfo de California, México, in shallow water. Leg. Fred Baker, 1921.

*domingana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 93-94, pl. 6, fig. 6

**H:** CASIZ 65047 (CAS 9647)

**Type locality:** Off Punta San Domingo, Golfo de California, México (26°52'00"N, 111°53'00"W), in 4-13 fm (7-24 m), sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*dorma*, *Mitrella* Baker, Hanna & Strong, 1938, 23(16): 248-249: pl. 24, fig. 6

**H:** CASIZ 65953 (CAS 5817)

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía de los Angeles, Golfo de California, México. Leg. Fred Baker, 1921.

*drangai*, *Balcis* (*Vitreolina*) Hertlein & Strong, 1951, 36(2): 91, pl. 6, fig. 2

**H:** CASIZ 65498

**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W) in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** In the genus *Melanella* Bowdich, 1822 (Bouchet & Warén, 1986).

*durhami*, *Conus* Hanna & Strong, 1949, 26(9): 306, pl. 5, fig. 16

**H:** UCMP 34200

**Type locality:** "south side of Carrizo Mountain, Imperial County, California; Pliocene; in a small

- canyon, about  $\frac{3}{8}$  mi. E of mouth of Alverson Canyon in small draws cut in basal conglomerate on west side of canyon, 100-120 yards from its mouth (Bramkamp)" (University of California Museum of Paleontology, collected from Loc. A-1269 (U.C.). Leg. R.A. Bramkamp.
- durhamianum*, *Epitonium* (*Nitidiscala*) Hertlein & Strong, 1951, 36(2): 89-90, pl. 3, fig. 9  
**H:** CASIZ 65091  
**P:** CASIZ 65093, 2 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in bottom of mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.
- eiseni*, *Cerithiopsis* Strong & Hertlein, 1939, 2(12): 216, pl. 20, fig. 6  
**H:** CASIZ 65665 (CAS 710)  
**V:** SDNHM 40755, 5 spec., at type locality, 1d and donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.
- ekidana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 99, pl. 4, fig. 8  
**H:** CASIZ 65042 (CAS 9587)  
**P:** CASIZ 65043 (CAS 9688, 9689), 2 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m) in sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- ericana*, *Crassispira* Hertlein & Strong, 1951, 36(2): 74, pl. 1, fig. 11  
**H:** CASIZ 65488  
**V:** CASIZ one lot, no number given  
**Type locality:** Bahía Santa Inez, Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m) in sand. Leg. Templeton Crocker Expedition, 22 Apr. 1936.  
**Comment:** In the genus *Strictispira* McLean, 1971 (McLean, *in Keen*, 1971).
- ericana*, *Rissoina* (*Folinia*) Hertlein & Strong, 1951, 36(2): 109-110, pl. 8, fig. 10  
**H:** CASIZ 65112  
**P:** CASIZ 65108, 1 spec.  
**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.  
**Comment:** *Folinia* Crosse, 1869, raised to a genus (Ponder, 1985a).
- erici*, *Liotia* Strong & Hertlein, 1939, 2(12): 237, pl. 21, fig. 9  
**H:** CASIZ 65679 (CAS 729)  
**V:** CASIZ one voucher lot, no number given  
**P:** SDNHM 40373 (3831), 1 spec., donor: Strong
- Type locality:** Bahía Honda, Veraguas, Panamá in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.  
**Comment:** In the genus *Parviturbo* Pilsbry & McGinty, 1945 (McLean *in Keen*, 1971).
- erminiana*, *Clathurella* Hertlein & Strong, 1951, 36(2): 71, pl. 1, fig. 8.  
**H:** CASIZ 65503  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía Santa Inez, off Bahía Concepción, Baja California Sur, México (26°57'30"N, 111°48'30"W) in 60 fm (110 m) in mud and crushed shell. Leg. Templeton Crocker Expedition, 17 Apr. 1936.  
**Comment:** As a synonym of *Lioglyphostoma ericia* (Hinds, 1843) (McLean *in Keen*, 1971).
- espiritum*, *Epitonium* (*Nodiscala*) Baker, Hanna & Strong, 1930, 19(5): 46, pl. 2, fig. 4  
**H:** CASIZ 66061 (CAS 4778)  
**P:** CASIZ 66062 (CAS 4779, 4780), 2 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Isla Espíritu Santo, Bahía Isthmus, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** Considered a synonym of *Opalia crystallina* (Carpenter, 1864) (DuShane, 1974).
- evermanni*, *Turbonilla* (*Cingulina*) Baker, Hanna & Strong, 1928, 17(7): 226-227, pl. 12, figs. 3, 4  
**H:** CASIZ 24961  
**Type locality:** Isla San José, West Anchorage, Golfo de California, México, in 4 fm (7 m). Leg. Fred Baker, 1921.  
**Comment:** *Cingulina* A. Adams, 1860, raised to a genus and moved from *Turbonilla* (Abbott, 1974).
- francisquitana*, *Turbonilla* (*Pyrgolampros*) Baker, Hanna & Strong, 1928, 17(7): 216, pl. 11, fig. 9  
**H:** CASIZ 66075 (CAS 4012)  
**Type locality:** Bahía Francisquito, Golfo de California, México. Leg. Fred Baker, 1921.
- gabrielensis*, *Odostomia* (*Salassia*) Baker, Hanna & Strong, 1928, 17(7): 227-228, pl. 12, fig. 6  
**H:** CASIZ 66084 (CAS 4032)  
**P:** CASIZ 66085 (CAS 4033), 1 spec.  
**Type locality:** Isla Espíritu Santo, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** *Salassia* Folin, 1885, raised to a genus (Odé, 1996).
- galapagana*, *Vanikoro* Hertlein & Strong, 1951, 36(2): 110, pl. 11, figs. 7, 8  
**H:** CASIZ 65099  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Isla Española (Hood Is.), Islas Galápagos, Ecuador. *Arcturus* Expedition, 1925. Leg. W. Beebe.
- gallegosi*, *Alvania* Baker, Hanna & Strong, 1930, 19(4): 26-27, pl. 1, fig. 11  
**H:** CASIZ 66051 (CAS 4599)  
**Type locality:** Cabo San Lucas, Baja California Sur, México, Leg. G D. Hanna & E.K. Jordan, 1925.

- Comment:** Ponder (1983a) placed this species in Cerithiidae without generic allocation.
- gallegosi*, *Nassarius* Strong & Hertlein, 1937, 22(6): 166-167, pl. 35, fig. 11
- H:** CASIZ 65973 (CAS 6980)
- P:** CASIZ 85647, 184 spec.
- V:** CASIZ one voucher lot, no number given
- Type locality:** Near Manzanillo, Colima, México (18°33'00"N, 103°45'00"W), dredged in 52 fm (95 m). Leg. Templeton Crocker Expedition, 17 July 1932.
- gallegosiana*, *Odostomia* (*Evalea*) Hertlein & Strong, 1951: 36(2): 104-105, pl. 8, fig. 1
- H:** CASIZ 65027
- P:** CASIZ 65026, 1 spec.
- Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937 & 5 Jan. 1938.
- Comment:** *Evalea* A. Adams, 1860, raised to a genus (Fretter & Graham, 1986).
- garthi*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 199, pl. 19, fig. 9
- H:** CASIZ 65644 (CAS 754)
- P:** CASIZ 85644, 1 spec.
- Type locality:** Bahía de Panam, Panam, between Islas Taboga and Urava, dredged in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.
- Comment:** Synonym of *Pyrgiscus shineki* (Dall & Bartsch, 1909) (Odé, 1996).
- gisna basilirata*, *Rissoina* Baker, Hanna & Strong, 1930, 19(4): 32, pl. 1, fig. 12
- H:** CASIZ 66055 (CAS 4606)
- Type locality:** Isla San José (at West Anchorage), Golfo de California, México. Leg. Fred Baker, 1921.
- Comment:** Synonym of *Rissoina stricta* Menke, 1850 (Abbott, 1974).
- gissleri*, *Cerithiopsis* Strong & Hertlein, 1939, 2(12): 216-217, pl. 20, fig. 7
- H:** CASIZ 65666 (CAS 711)
- V:** SDNHM 40756, 9 spec. at type locality, Leg. Hertlein. Id and donor: Strong, ex Strong Collection
- Type locality:** Bahía Honda, Veraguas, Panam in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.
- gissleri*, *Epitonium* (*Nitidiscala*) Strong & Hertlein, 1939, 2(12): 194-195, pl. 18, fig. 8
- H:** CASIZ 65661 (CAS 723)
- P:** SDNHM 41046 (3688, 3689), 2 spec.
- Type locality:** Off Isla Taboga, Bahía de Panam, Panam, dredged in 3-9 fm (6-16 m). Allan Hancock Expedition. Leg. Leo G. Hertlein, 1 Feb. 1932.
- Comment:** As a synonym of *E. cumingii* (Carpenter, 1856) (DuShane, 1974).
- golischi*, *Epitonium* (*Nodiscala*) Baker, Hanna & Strong, 1930, 19(5): 44-45, pl. 2, figs. 1, 2.
- H:** CASIZ 66059 (CAS 4770)
- V:** CASIZ one voucher lot, no number given
- Type locality:** Isla San Francisco, Golfo de California, México. Leg. Fred Baker, 1921.
- P:** CASIZ 66060 (CAS 4771), one spec. ("half-grown")
- Type locality:** Puerto Escondido, Golfo de California, México. Leg. Fred Baker, 1921.
- Comment:** As a synonym of *Opalia crenatoides* (Carpenter, 1864) (DuShane, 1974).
- gonzagensis*, *Turbonilla* (*Pyrgolampros*) Baker, Hanna & Strong, 1928, 17(7): 213-214, pl. 11, fig. 7
- H:** CASIZ 66072 (CAS 4006)
- P:** CASIZ 66073 (CAS 4007-4010), 4 spec.
- Type locality:** Bahía San Luis Gonzaga, Golfo de California, México, in 3 fm (6 m). Leg. Fred Baker, 1921.
- gordana*, *Cyclostrema* Hertlein & Strong, 1951, 36(2): 110, pl. 9, figs. 3, 4, 7
- H:** CASIZ 64803
- Type locality:** Gorda Banks, Golfo de California, México (23°05'00"N, 109°30'00"W), in 40-45 fm (73-82 m) in muddy sand. Leg. Templeton Crocker Expedition, 22 Apr. 1936.
- Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (DuShane in Keen, 1971).
- gordoniana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 99, pl. 5, fig. 1
- H:** CASIZ 65039
- P:** CASIZ 65040, 1 spec.
- Type locality:** Corinto, Chinandega, Nicaragua, beach drift. Leg. Eastern Pacific *Zaca* Expedition, 1937 or 1938.
- Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- granti*, *Alvania* Strong, 1938, 23(14): 210-211, pl. 15, fig. 8
- H:** CASIZ 65897 (CAS 5825)
- Type locality:** E side of Isla María Madre, Islas Tres Marías, off Nayarit, México, dredged in 10-25 fm (18-46 pm). Leg. G D. Hanna.
- V:** SDNHM 40786, 2 spec. from type locality, donor: Strong.
- Comment:** Ponder (1983b) placed this species in *Lirobarleeia* Ponder, 1983.
- granti*, *Delphinoidea* Baker, Hanna & Strong, 1938, 23(15): 236-237, pl. 22, figs. 4-6
- H:** CASIZ 65947 (CAS 5468)
- Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, June 1925.
- Comment:** In the genus *Solariorbis* Conrad, 1865 (Keen & Coan, 1975).
- grijalve*, *Odostomia* (*Menestho*) Baker, Hanna & Strong, 1928: 17(7); 238-239, pl. 12, fig. 16
- H:** CASIZ 66096 (CAS 4055)
- P:** CASIZ 66097 (CAS 4056), 1 spec.
- Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E. K. Jordan, 1925.



- Comment:** *Menestho* Möller, 1842, raised to a genus (Vaught, 1989).
- gruberi*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 100, pl. 4, fig. 3
- H:** CASIZ 65012
- Type locality:** Corinto, Chinandega, Nicaragua, beach drift, 1937 or 1938.
- P:** CASIZ 65008, 2 spec.
- Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.
- Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- guadalupensis*, *Cerithiopsis* Strong, 1938, 23(14): 206-207, pl. 16, fig. 6
- H:** CASIZ 65891 (CAS 5810)
- V:** SDNHM 5338, 2 spec., type locality, leg. CAS, Id F. Baker, donor: Baker Estate.
- Type locality:** W end of Isla Guadalupe, off Baja California, México, in 9-15 fm (16-27 m) in a semi-sheltered cove in sandy bottom. Leg. G D. Hanna, E.K. Jordan & J.R. Slevin.
- guadalupensis*, *Rissoina* Strong, 1938, 23(14): 208-209, pl. 15, fig. 7
- H:** CASIZ 065894 (CAS 5812)
- P:** SDNHM 40324 (3519-3524), 6 spec., donor: Strong
- Type locality:** S end of Isla Guadalupe, off Baja California, México, in a small patch of sandy bottom in a semi-sheltered cove, in 9-15 fm (16-27 m). Leg. G D. Hanna, E. K. Jordan & J. R. Slevin.
- Comment:** No collecting date listed on label (pers. comm. G. Metz, 3/22/06).
- guaicurana*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 80-81, pl. 12, fig. 1
- H:** CASIZ 65449 (CAS 9477)
- Type locality:** La Paz, Baja California Sur, México. Leg. Fred Baker, 1921.
- Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- guanacastensis*, *Cerithiopsis* Hertlein & Strong, 1951, 36(2): 106, pl. 7, fig. 10
- H:** CASIZ 65132
- Type locality:** Long Beach, NW of Port Parker, Bahía Elena, Puntarenas, Costa Rica.
- guanacastensis*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 97-98, pl. 5, fig. 11
- H:** CASIZ 65035
- P:** CASIZ 65036, 2 spec.
- Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), dredged in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.
- Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- guatulcoensis*, *Cerithiopsis* Hertlein & Strong, 1951, 36(2): 106, pl. 7, fig. 7
- H:** CASIZ 65483
- P:** CASIZ 65485, 4 spec.
- Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), dredged in 7 fm (12.6 m) in gravelly sand, crushed shell bottom. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- P:** CASIZ 65484, 1 spec.
- Collecting data:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W) in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- guatulcoensis*, *Odostomia* (*Chrysallida*) Hertlein & Strong, 1951: 36(2): 103-104, pl. 7, fig. 2
- H:** CASIZ 65004
- Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), dredged in 7 fm (12.6 m), in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).
- guatulcoensis*, *Turbonilla* (*Mormula*) Hertlein & Strong, 1951, 36(2): 92, pl. 6, fig. 9
- H:** CASIZ 65034
- Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- guerreroensis*, *Anachis* Strong & Hertlein, 1937, 22(6): 169, pl. 35, fig. 4
- H:** CASIZ 65976 (CAS 6983)
- P:** CASIZ 85650, 3 spec.
- V:** CASIZ one voucher lot, no number given
- Type locality:** 33 mi E of Acapulco, Guerrero, México (16°39'00"N, 99°24'30"W to 16°38'00"N, 99°27'30"W) dredged in 20-45 fm (37-82 m). Leg. Templeton Crocker Expedition, 15 July 1932.
- Comment:** In the genus *Parvanachis* Radwin, 1968 (Radwin, 1974).
- haleyi*, *Turbonilla* (*Strioturbonilla*) Strong & Hertlein, 1939, 2(12): 198, pl. 19, fig. 2
- H:** CASIZ 65643 (CAS 753)
- Type locality:** Off Isla Taboga, Veraguas, Panamá, dredged in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.
- hambachi*, *Delphinoidea* Strong & Hertlein, 1939, 2(12): 243-244, pl. 22, figs. 8-10
- H:** CASIZ 65675 (CAS 720)
- Type locality:** Off Isla Taboga, Golfo de Panamá, Panamá, dredged in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 1 Feb. 1932.
- Comment:** In the genus *Solariorbis* Conrad, 1865 (DuShane in Keen, 1971).
- hancocki*, "*Mangelia*" Hertlein & Strong, 1939, 23(24): 375, pl. 32, fig. 9
- H:** CAS 4693, Geology/Fossil Type Collection



**Type locality:** Bahía James, Isla San Salvador, Islas Galápagos, Ecuador, on raised beach, 5 to 10 m above sea level, Pleistocene. Leg. Leo G. Hertlein. Allan Hancock Expedition, 1931-1932.

**Comment:** In the genus *Nassarina* Dall, 1889, (McLean in Keen, 1971).

*hancocki*, *Megalomphalus* Strong & Hertlein, 1939, 2(12): 235-236, pl. 23, figs. 1-4

**H:** CASIZ 65681 (CAS 731)

**P:** SDNHM 13018 (3816), 1 spec., donor: Strong

**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 1 Feb. 1932.

**P:** CASIZ 65682

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.

**Comment:** In the genus *Macromphalina* Cossmann, 1888 (Keen, 1971).

*hancocki*, *Pyramidella* (*Pyramidella*) Strong & Hertlein, 1939, 2(12): 195-196, pl. 18, fig. 12.

**H:** CASIZ 65689 (CAS 739)

**P:** CASIZ 85641, 5 spec.

**P:** SDNHM 41260 (3692-3694), 3 spec., donor: A.M. Strong

**Type locality:** Between Islas Taboga and Urava, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.

*hannai*, *Delphinoidea* Strong & Hertlein, 1939, 2(12): 242-243, pl. 22, figs. 5-7

**H:** CASIZ 65676 (CAS 721)

**P:** SDNHM 41363 (3860-3862), 3 spec.

**Type locality:** Bahía Honda, Veraguas, Panamá in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comment:** In the genus *Solariorbis* Conrad, 1865 (DuShane in Keen, 1971).

*hannai*, *Turbonilla* (*Careliopsis*) Strong, 1938, 23(14): 204, pl. 15, fig. 3

**H:** CASIZ 65883 (CAS 5828)

**Type locality:** Off E side of Isla María Madre, Islas Tres Marias, off México, in front of the penal settlement in 10-25 fm (18-46 m). Leg. G D. Hanna & E. K. Jordan.

**Comment:** *Careliopsis* Mörch, 1875, raised to a genus (Odé, 1994a).

*harfordi*, *Mitrella* Strong & Hertlein, 1937, 22(6): 167-168, pl. 35, fig. 15

**H:** CASIZ 65974 (CAS 6981)

**P:** CASIZ 85648, 14 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** 33 mi E of Acapulco, Guerrero, México and 32 mi W of Bahía Dulce (16°38'00"N, 99°27'30"W to 16°39'00"N, 99°24'30"W), dredged in 20-45 fm (37-82 m). Leg. Templeton Crocker Expedition, 15 July 1932.

*healeyi*, *Strombiformis* Strong & Hertlein, 1939, 2(12): 195, pl. 18, fig. 7

**H:** CASIZ 65690 (CAS 742)

**P:** SDNHM 40390 (3690, 3691), 2 spec., donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panamá, dredged in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comment:** In the genus *Eulima* Risso, 1826 (Keen, 1971).

*heimi*, *Liotia* Strong & Hertlein, 1939, 2(12): 238, pl. 21, figs. 4, 7

**H:** CASIZ 65680 (CAS 730)

**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m), Leg. Leo G. Hertlein, Allan Hancock Expedition, 1 Feb. 1932.

**P:** SDNHM 40372 (3832, 3833), 2 spec.

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 1 Feb. 1932.

**Comment:** Synonym of *Parviturbo stearnsii* (Dall, 1918) (McLean in Keen, 1971).

*hemphilli*, *Latirus* Hertlein & Strong, 1951, 36(2): 79-80, pl. 2, fig. 4

**H:** CASIZ 65082

**V:** CASIZ one voucher lot, no number given

**Type locality:** Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica. Eastern Pacific *Zaca* Expedition, Jan. 1938.

**P:** CASIZ 65075, 1 spec.

**Type locality:** Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica, beach specimen. Leg. Capt. F. E. Lewis.

*herbertiana*, *Teinostoma* Hertlein & Strong, 1951, 36(2): 112, pl. 9, figs. 8, 11, 12

**H:** CASIZ 65094

**P:** CASIZ 65095, 4 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

*herreriae*, *Alvania* Baker, Hanna & Strong, 1930, 19(4): 25-26, pl. 1, fig. 2

**H:** CASIZ 66050 (CAS 4598)

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, 1925.

**V:** SDNHM 40410, 1 spec. from type locality, donor: Strong.

**Comment:** Ponder (1983b) placed this species in *Lirobarleeia*, Ponder, 1983.

*herreriae*, *Odostomia* (*Pyrgulina*) Baker, Hanna & Strong, 1928: 17(7): 233-234, pl. 12, fig. 9

**H:** CASIZ 66091 (CAS 4041)

**Type locality:** Golfo de California, México. Leg. George D. Porter.

*hertleini*, *Odostomia* (*Salassia*) Strong, 1938, 23(14): 205-206, pl. 15, fig. 9

- H:** CASIZ 65885 (CAS 5811)  
**P:** SDNHM 40630 (3513-3516), 4 spec., donor: Strong  
**Type locality:** Off E side of Isla María Madre, Islas Tres Marias, off Nayarit, México, in front of the penal settlement in 10-25 fm (18-46 m). Leg. G D. Hanna.  
**Comment:** *Salassia* Folin, 1885, raised to a genus (Odé, 1996).
- hilli**, *Crockerella* Hertlein & Strong, 1951, 36(2): 79, pl. 1, fig. 16  
**H:** CASIZ 65505  
**P:** CASIZ 65506, 2 spec.  
**P:** CASIZ 64507, 1 spec.  
**Type locality:** Bahía Santa Inez, Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m) on sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.  
**Comment:** As a synonym of *Pyrgocythara melita* (Dall, 1919) (McLean, in Keen, 1971).
- Hindsiclava** Hertlein & Strong, 1955  
**Type species:** *Pleurotoma militaris* Hinds, 1843, in Reeve (1843-1878).
- howelli**, *Fusiturricula* Hertlein & Strong, 1951, 36(2): 72, pl. 8, fig. 8  
**H:** CASIZ 65121  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** 14 mi SE Punta Judas, Puntarenas, Costa Rica (9°19'32" to 9°17'40"N, 84°29'30" to 84°27'30"W), dredged 42-61 fm (76.5-112 m) in mud, shell, rocks. Leg. Templeton Crocker Expedition, 11 Apr. 1936.  
**Comment:** In the genus *Knefastia* Dall, 1919 (McLean, in Keen, 1971).
- humboldti**, *Cyclostremiscus* Hertlein & Strong, 1951, 36(2): 110-111, pl. 10, fig. 1  
**H:** CASIZ 65507  
**P:** CASIZ 65508, 3 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W) in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 21 Jan. 1938.  
**Comment:** In the genus *Aorotrema* Schwengel & McGinty, 1942 (Keen, 1971).
- incantata**, *Odostomia* (*Miralda*) Hertlein & Strong, 1939, 23(24): 374, pl. 32, fig. 19  
**H:** CASIZ 65871 (CAS 735)  
**P:** CASIZ 85634, 4 spec.  
**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.  
**Comment:** Placed in the genus *Triptychus* Mörch, 1875 (LaFollette, 1977).
- ingrami**, ?*Alvania* Hertlein & Strong, 1951, 36(2): 108, pl. 7, fig. 6.  
**H:** CASIZ 65493  
**P:** CASIZ 65494, 3 spec.  
**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- Comment:** Ponder (1983b) placed this species in *Lirobarleeia* Ponder, 1983.
- insculptus gordanus**, *Nassarius* Hertlein & Strong, 1951, 36(2): 81-82, pl. 8, fig. 6 [new subspecies]  
**H:** CASIZ 65081  
**Type locality:** Gorda Banks Golfo de California, México (23°02'00"N, 109°31'00"W), in 60 fm (109 m) in muddy sand. Leg. Templeton Crocker Expedition, 21 Apr. 1936.  
**V:** CASIZ 65079, 2 spec.  
**Type locality:** Gorda Banks Golfo de California, México (23°01'N, 109°24'W), in sand bottom. Leg. Templeton Crocker Expedition, 21 Apr. 1936.  
**Comments:** The voucher specimens above were considered paratypes (CAS 9586, 9587) but it was determined that they were not types and they are now voucher specimens, but they are in the database of CASIZ (pers. comm. G. Metz, 3/25/ 2006).  
 Synonym of *Nassarius insculptus* (Carpenter, 1864) (Keen, 1971).
- israeli**, *Turbonilla* (*Careliopsis*) Strong & Hertlein, 1939, 2(12): 204, pl. 19, fig. 13  
**H:** CASIZ 65650 (CAS 755)  
**P:** CASIZ 65651, 2 spec.  
**P:** SDNHM 40385 (3701, 3702), 2 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.  
**Comment:** *Careliopsis* Mörch, 1875, raised to a genus (Odé, 1994a).
- isthmica**, *Odostomia* (*Evalea*?) Strong & Hertlein, 1939, 2(12): 208-209, pl. 19, fig. 12  
**H:** CASIZ 65688 (CAS 736)  
**P:** CASIZ 66834, 11 spec.  
**P:** LACM 1156, 1 dry spec.  
**Type locality:** Bahía Honda, Isla Coiba, Veraguas, Panamá, in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.  
**P:** SDNHM 40483 (3716-3720), 5 spec., donor: Strong  
**Type locality:** Isla Taboga, Bahía de Panamá, Panamá, dredged, Allan Hancock Pacific Expedition.  
**Comment:** *Evalea* A. Adams, 1860, raised to a genus (Fretter & Graham, 1986).
- johnsoni**, *Turbonilla* (*Pyrgiscus*) Baker, Hanna & Strong, 1928, 17(7): 218-219, pl. 11, fig. 11  
**H:** CASIZ 66077 (CAS 4014)  
**Type locality:** Golfo de California, México. Leg. George D. Porter.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- johnstoni**, *Rissoella* Baker, Hanna & Strong, 1930, 19(4): 36-37, pl. 1, fig. 16  
**H:** CASIZ 66058 (CAS 4612)  
**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E. K. Jordan, 1925.  
**Comment:** Genus changed to *Elachisina* Dall, 1918 and placed in Elachisinidae (Ponder, 1985b).

*jordani*, *Alabina* Strong, 1938, 23(14): 208, pl. 16, fig. 9

H: CASIZ 65893 (CAS 5818)

Type locality: S end of Isla Guadalupe, Baja California, México, dredged in 9-15 fm (16-27 m) from a small patch of sandy bottom in a semi-sheltered cove. Leg. G D. Hanna, J.R. Slevin & E.K. Jordan.

Comment: In the genus *Bittium* Leach, in Gray, 1847 (McLean & Coan, 1996).

*jordani*, *Colubraria* Strong, 1938, 23(14): 212, pl. 16, fig. 8

H: CASIZ 65899 (CAS 7017)

V: CASIZ one voucher lot, no number given

P: SDNHM 41060 (3550, 3551) 2 spec., donor: Strong

Type locality: Isla Socorro, Islas Revillagigedo, México, shore. Leg. G D. Hanna & E.K. Jordan, July 1925.

*kaliwana*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 79-80, pl. 11, fig. 6

H: CASIZ 65450 (CAS 9474)

P: CASIZ 65451 (CAS 9475, 9476), 2 spec.

V: SDNHM 41214, 2 spec., type locality, donor: Strong

Type locality: Bahía San Luis Gonzaga, Golfo de California, México. Leg. Fred Baker, 1921.

Comment: *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*keepi*, *Trophon* Strong & Hertlein, 1937: 170, pl. 35, fig. 8

H: CASIZ 65691 (CAS 6985)

Type locality: Off W end of San Nicolas Island, Channel Islands, California, dredged in 30-50 fm (55-91 m). Leg. Templeton Crocker Expedition, 27 August 1932.

Comment: In the genus *Boreotrophon*. Fischer, 1884 (McLean, 1996).

*kelseyi*, *Epitonium* (*Asperiscala*) Baker, Hanna & Strong, 1930, 19(5): 48-50, pl. 2, fig. 7

H: CASIZ 66063 (CAS 4766)

V: CASIZ one voucher lot, no number given

Type locality: Isla San Francisco, Golfo de California, México. Leg. Fred Baker, 1921.

Comment: As a synonym of *E. habeli* Dall, 1917 (DuShane, 1974).

*kinoi*, *Cerithiopsis* (*Cerithiopsida*) Baker, Hanna & Strong, 1938, 23(15): 221-222, pl. 18, fig. 6

H: CASIZ 65942 (CAS 5451)

Type locality: Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, June 1925.

Comment: On page 222, pl. 19, fig. 6, the authors list *Cerithiopsis* (*Cerithiopsida*) *kinoi*, (subspecies?) from the same type locality with no type listed. They state, "We refrain from giving this shell a subspecific name, preferring to await further collecting to determine its validity."

*kochi*, *Iselica* Strong & Hertlein, 1939, 2(12): 227, pl. 19, fig. 11

H: CASIZ 65667 (CAS 727)

P: CASIZ 85640, 2 spec.

P: LACM 1715, one dry spec.

Type locality: Bahía Honda, Isla Coiba, Veraguas,

Panamá, in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.

*lohri*, *Micranellum* Strong & Hertlein, 1939, 2(12): 225-226, pl. 20, figs. 12, 13

H: CASIZ 65684 (CAS 732)

P: CASIZ 65685, 1 spec.

V: CASIZ one voucher lot, no number given

P: SDNHM 40666 (3781-3788), 8 spec.

Type locality: Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leo G. Hertlein, Allan Hancock Expedition, 1 Feb. 1932.

Comment: As *Caecum* (*C.*) *lohri* (Lightfoot, 1993a).

*lowei*, *Cyclostrema* Baker, Hanna & Strong, 1938, 23(15): 233-234, pl. 20, figs. 1-3

H: CASIZ 65943 (CAS 5461)

P: SDNHM 48001 (1920), 1 spec.

V: SDNHM 41357, 1 spec. donor: Strong

Type locality: Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, June 1925

Comments: Paratype listed as "ecotype" by Wilson & Kennedy, 1967. In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (DuShane in Keen, 1971).

*lowei*, *Rissoina* Strong, 1938, 23(14): 209, pl. 16, fig. 7

H: CASIZ 65895 (CAS 5814)

P: SDNHM 40214 (3525-3540)

Type locality: Off Isla Guadalupe, Baja California, México, dredged in 9-15 fm (16-27 m) in sand. Leg. G D. Hanna, E. K. Jordan & J. R. Slevin.

Comments: Ponder (1983b) placed the species in *Lirobarleeia* Ponder, 1983, and as a synonym of *Lirobarleeia kelseyi* (Dall & Bartsch, 1902).

*lowei*, *Volvulella* Strong & Hertlein, 1937, 22(6): 164-165, pl. 35, fig. 2

H: CASIZ 65971 (CAS 6978)

V: CASIZ one voucher lot, no number given

Type locality: Puerto Escondido, Golfo de California, México. Expedition of the California Academy of Sciences to the Gulf of California, Leg. Fred Baker, 1921.

Comment: Synonym of *Volvulella cylindrica* (Carpenter, 1864) (Keen, 1971).

*lucasana*, *Alvania* Baker, Hanna & Strong, 1930, 19(4): 24-25, pl. 1, fig. 1.

H: CASIZ 66049 (CAS 4597)

Type locality: Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E.K. Jordan, 1925.

Comment: Ponder (1983b) placed this species in *Lirobarleeia*, Ponder, 1983.

*lucasana*, *Delphinoidea* Baker, Hanna & Strong, 1938, 23(15): 237-238, pl. 19, figs. 10-12

H: CASIZ 65948 (CAS 5460)

Type locality: Cabo San Lucas, Baja California Sur, México. Leg. Hanna & E.K. Jordan, June 1925.

Comment: As *Vitrinella* C.B. Adams, 1852 (Keen, 1971).

*lucasensis*, *Colubraria* Strong & Hertlein, 1937, ser 4, 22(6): 173-174, pl. 35, fig. 17

H: CASIZ 65985 (CAS 6995)



- V:** CASIZ one voucher lot, no number given  
**Type locality:** Off Cabo San Lucas, Baja California Sur, México, dredged in 20-25 fm (37-46 m) off big rocks. Leg. Templeton Crocker Expedition, 6 August 1932.  
*lucasensis*, *Liotia* Strong, 1934, 7(37): 441, pl. 29, figs. 10-12  
**H:** CASIZ 66003 (CAS 5477)  
**P:** SDNHM 41275 (3397-3402), 6 spec., donor: Strong  
**V:** SDNHM 59442, 3 spec., ex F. Baker Collection  
**V:** SDNHM 41376, 10 spec., leg. and donor: Strong  
**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E. K. Jordan, June 1925.  
**Comment:** In the genus *Haplocochlias* Carpenter, 1864, (McLean *in* Keen, 1971). Label of SDNHM 41376 states "Strong, n. sp." Label of SDNHM 55492 states "topotype."
- lyrta*, *Amphissa* Baker, Hanna & Strong, 1938 23(16): 252-253, pl. 15, fig. 1 (fig. in PCAS 23, no. 14)  
**H:** CASIZ 65905 (CAS 5816)  
**V:** one voucher lot of 1 spec., no number given  
**Type locality:** Isla Partida, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** In the genus *Decipifus* *in* Keen, 1971.
- Macrarena* Hertlein & Strong, 1951: 36(2): 110 [new genus]  
**Type species:** *Liotia (Arenie) californica* Dall, 1908.  
*madreensis*, *Circulus* Baker, Hanna & Strong, 1938, 23(15): 236, pl. 23, figs. 1-3  
**H:** CASIZ 65946 (CAS 5469)  
**P:** SDNHM 47985 (1928-1929), 2 spec. (1 immature, 1 juvenile), donor: Fred Baker  
**P:** SDNHM 39870 (1925-1927), 3 spec., donor: Strong  
**Type locality:** Isla María Madre, Islas Tres Marias, off Nayarit, México. Leg. G D. Hanna & E.K. Jordan, June 1925.  
**Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (DuShane *in* Keen, 1971).
- madriella*, *Turbonilla (Pyrgiscus)* Strong, 1938, 23(14): 204-205, pl. 15, fig. 4  
**H:** CASIZ 65884 (CAS 5815)  
**P:** SDNHM 40387 (3505-3512), 8 spec., donor: Strong  
**Type locality:** Off E side of Isla María Madre, Islas Tres Marias, off Nayarit, México, in front of the penal settlement in 10-25 fm (18-46 m). Leg. G D. Hanna.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- manzanillense*, *Epitonium (Asperiscala)* Hertlein & Strong, 1951, 36(2): 88, pl. 3, fig. 13  
**H:** CASIZ 65088  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Near Manzanillo, Colima, México (19°04'00"N, 104°22'00"W), dredged in 30 fm (55 m) in gravelly sand. Leg. Eastern Pacific *Zaca* Expedition, 22 Nov. 1937.  
**Comment:** As a synonym of *E. emydonesus* Dall, 1917 (DuShane, 1974).
- mariae*, *Cyclostrema* Baker, Hanna & Strong, 1938, 23(15): 234, pl. 21, figs. 7-9  
**H:** CASIZ 65944 (CAS 5465)  
**Type locality:** Isla María Madre, Islas Tres Marias, off Nayarit, México. Leg. G D. Hanna & E.K. Jordan, June 1925.  
**Comment:** In the genus *Lydiplhuis* Melvill, 1906 (DuShane *in* Keen, 1971).
- marksi*, *Strombina* Hertlein & Strong, 1951, 36(2): 84, pl. 2, fig. 7  
**H:** CASIZ 36684  
**P:** CASIZ 36685, 1 spec.  
**Type locality:** Arena Bank, Baja California Sur, México (23°32'00"N, 109°27'00"W), in 55 fm (100 m). Leg. Templeton Crocker Expedition, 19 Apr. 1936.  
**P:** CASIZ 36686, 1 spec.  
**P:** CASIZ 64514, 1 spec.  
**Type locality:** Arena Bank, Baja California Sur, México (23°29'30"N, 109°25'30"W), in 45 fm (82 m) in muddy sand and weed. Leg. Templeton Crocker Expedition, 19 Apr. 1936.
- marksi*, *Teinostoma hemphilli* Strong & Hertlein, 1939, 2(12): 244, pl. 23, figs. 5, 8, 11  
**H:** CASIZ 65692 (CAS 743)  
**P:** SDNHM 39772 (3863-3866), 4 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.
- marshi*, *Triphora* Strong & Hertlein, 1939, 2(12): 214-215, pl. 20, figs. 2, 3  
**H:** CASIZ 65693 (CAS 745)  
**P:** CASIZ 65694 (CAS 745A), 1 spec.  
**P:** SDNHM 41020 (3727-3730), 4 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.
- martensiana*, *Scissilabra* Hertlein & Strong, 1951, 36(2): 111, pl. 9, figs. 1, 5, 10  
**H:** CASIZ 65083  
**Type locality:** Corinto, Chinandega, Nicaragua, in beach drift, 1937 or 1938.  
**P:** CASIZ 65087, 3 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.  
**Comment:** In the genus *Vitrinella* C.B. Adams, 1852 (Keen, 1971).
- martinensis*, *Odostomia (Evalea)* Strong, 1938: 23(14): 206, pl. 15, fig. 10  
**H:** CASIZ 65890 (CAS 5813)  
**P:** SDNHM 40595 (3517, 3518), 2 spec.  
**Type locality:** Isla San Martín, Baja California, México, in beach drift. Leg. G D. Hanna & E. K. Jordan.  
**Comment:** *Evalea* A. Adams, 1860, raised to a genus (Fretter & Graham, 1986).



*masayana*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 101, pl. 4, fig. 4

**H:** CASIZ 64976

**P:** CASIZ 64974, 2 spec.

**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Eastern Pacific Zaca Expedition, 5 Jan. 1938.

*mayana*, *Turbonilla* (*Pyrgiscus*) Baker, Hanna & Strong, 1928, 17(7): 219-220, pl. 11, fig. 12

**H:** CASIZ 66078 (CAS 4015)

**Type locality:** Golfo de California, México. Leg. George D. Porter.

**Comment:** Synonym of *Pyrgiscus striosa* (C.B. Adams, 1852) (Odé, 1996).

*mazatlanica*, *Phasianella* (*Eulithidium*) Strong, 1928, 17(6): 198-199, pl. 10, fig. 15, [new name for *Phasianella perforata* Philippi of Carpenter, 1857: 224].

**Comment:** A synonym of *Eulithidium perforata* (Philippi, 1848). Keen states that "*P. perforata* Philippi" of Reeve, 1862, was a misidentification which was copied by Strong, 1928 as *P. (E.) mazatlanica* (McLean in Keen, 1971).

*mccullochae*, *Cyclostrema* Strong & Hertlein, 1939, 2(12): 239, pl. 21, figs. 8, 10, 11

**H:** CASIZ 65674 (CAS 716)

**P:** SDNHM 41277 (3840-3856), 17 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panam, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.

**Comment:** As a synonym of *Solariorbis coninnus* (C.B. Adams, 1852) (DuShane in Keen, 1971).

*mcguirei*, *Turbonilla* (*Strioturbonilla*) Strong & Hertlein, 1939, 2(12): 197-198, pl. 19, fig. 1

**H:** CASIZ 65642 (CAS 756)

**Type locality:** Isla Taboga, Veraguas, Panam, dredged in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.

*meanguerensis*, *Turbonilla* (*Pyrgolampros*) Hertlein & Strong, 1951, 36(2): 100-101, pl. 4, fig. 6

**H:** CASIZ 64983

**Type locality:** Isla Meanguera, Golfo de Fonseca, La Unión, El Salvador (13°08'00"N, 87°43'00"W), in 16 fm (29 m), sand, mud, crushed shell. Leg. Eastern Pacific Zaca Expedition, 23 Dec. 1937.

*mediamericanus*, *Latirus* Hertlein & Strong, 1951: 80-81, pl. 11, figs. 3, 10

**H:** CASIZ 65086

**Type locality:** Isla Gorgona, Colombia.

**Comments:** This was proposed as a new species but an earlier name *Turbinella castanea* Reeve, 1847, was a junior homonym of *T. castanea* Gray, 1839. It thus has its own type material and locality (Coan & Petit, 2006). Dimensions of the holotype and paratype are given but no repository of type material is listed in original

description. Type located (R. Van Syoc, 17 Oct. 2006).

*melanelloides*, *Rissoina* Baker, Hanna & Strong, 1930, 19(4): 31-32, pl. 1 fig. 5

**H:** CASIZ 55054

**P:** SDNHM 49095 (1915), 1 spec., donor: Fred Baker

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E. K. Jordan, 1925.

*mendozae*, *Odostomia* (*Ividella*) Baker, Hanna & Strong, 1928: 17(7): 234-235, pl. 12, fig. 11

**H:** CASIZ 65102 (CAS 4042). See comment.

**P:** CASIZ 66093 (CAS 4043-4045), 3 spec.

**P:** SDNHM 40642 (1840-1842), 3 spec., donor: Strong

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G D. Hanna & E. K. Jordan, California Academy of Sciences Expedition, 1925.

**Comments:** The holotype [CASIZ (CAS 4042)] is missing. "There is a vial with labels and no CASIZ number, with a note in the vial that it was missing in 1948, noted by Myra Keen" (pers. comm. G. Metz, 2/08/06). *Ividella* Dall & Bartsch, 1909, raised to a genus (McLean, 1984).

*milleriana*, *Alvania* Hertlein & Strong, 1951, 50(3): 154-155, pl. 51, fig. 4

**H:** CASIZ 64934 (CAS 9538)

**Type locality:** Bahía Ballena (W end of inner shore line), Golfo de Nicoya, Costa Rica. Leg. H.W. Miller.

**Comment:** As a synonym of *Lapsigyrus mutans* (Carpenter, 1857) (Ponder, 1985a).

*monserratensis*, *Alvania* Baker, Hanna & Strong, 1930, 19(4): 27-28, pl. 1, fig. 9

**H:** CASIZ 66052 (CAS 4600)

**V:** SDNHM 14425, 5 spec. from type locality, ex F. Baker Coll'n. (with Baker's original blue label).

**Type locality:** Isla Monserrate, Golfo de California. Leg. Fred Baker, 1921.

**Comment:** Synonym of *Alvania inconspicua* (C.B. Adams, 1852) (Ponder, 1985a).

*montezunai*, *Cerithiopsis* Strong & Hertlein, 1939, 2(12): 217-218, pl. 20, fig. 8

**H:** CASIZ 65667 (CAS 712)

**V:** CASIZ one voucher lot, no number given

**Type locality:** On rocks below Delessep Monument at Panama City, Pacific coast Panam. Leg. Leo G. Hertlein. Allan Hancock Expedition, 29 Jan. 1932.

**V:** SDNHM 40758, 5 spec.

**Type locality:** Off Isla Taboga, Panam, dredged.

**Comments:** The voucher specimens from SDNHM were mentioned under the original description.

*nahuana*, *Turbonilla* (*Strioturbonilla*) Baker, Hanna & Strong, 1928, 17(7): 211-212, pl. 11, fig. 5

**H:** CASIZ 66070 (CAS 4004)

**P:** SDNHM 49087 (1834), one spec., donor: Fred Baker Collection

**Type locality:** Golfo de California, México. Leg. George D. Porter, 1921.

*nahuatlana*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 101-102, pl. 5, fig. 14

- H:** CASIZ 63380  
**P:** CASIZ 63365, 3 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m), in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.
- navarretei*, *Odostomia* (*Menestho*) Baker, Hanna & Strong, 1928, 17(7): 239, pl. 12, fig. 17  
**H:** CASIZ 66098 (CAS 4057)  
**Type locality:** Isla San José, Bahía Amortajada, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** *Menestho* Möller, 1842, raised to a genus (Vaught, 1989).
- nicaraguana*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 102, pl. 4, fig. 7  
**H:** CASIZ 63377  
**P:** CASIZ 63374, 1 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.
- nicarasana*, *Turbonilla* (*Chemnitzia*) Hertlein & Strong, 1951: 36(2): 92, pl. 6, fig. 8  
**H:** CASIZ 63382  
**P:** CASIZ 63381, 1 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.
- nicholsoni*, *Circulus* Strong & Hertlein, 1939, 2(12): 241-242, pl. 22, figs. 2-4  
**H:** CASIZ 65671 (CAS 714)  
**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 1 Feb. 1932.  
**Comment:** In the genus *Episcynia* Mörch, 1875 (Keen, 1971). Holotype broken (Myers, Hertz & Gemmell, 1990).
- nicoyana*, *Odostomia* (*Menestho*) Hertlein & Strong, 1951: 36(2): 105, pl. 8, fig. 3  
**H:** CASIZ 65030  
**P:** CASIZ 65031, 2 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m), shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** *Menestho* Möller, 1842, raised to a genus (Vaught, 1989).
- nicoyana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 96-97, pl. 3, fig. 4  
**H:** CASIZ 64978  
**P:** CASIZ 65031, 2 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), dredged in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- Notocytharella* new genus Hertlein & Strong, 1955  
**Type species:** *Cytharella niobe* Dall, 1919.
- oaxacana*, *Cerithiopsis* Hertlein & Strong, 1951, 36(2): 107, pl. 7, fig. 4  
**H:** CASIZ 65128  
**P:** CASIZ 65129, 2 spec.  
**Type locality:** off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell bottom. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- oaxacana*, *Turbonilla* (*Strioturbonilla*) Hertlein & Strong, 1951, 36(2): 101, pl. 5, fig. 9  
**H:** CASIZ 64975  
**P:** CASIZ 64977, 1 spec.  
**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), gravelly sand, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- ochsneri*, *Teinostoma* Strong & Hertlein, 1939, 2(12): 244-245, pl. 23, figs. 6, 9, 12  
**H:** CASIZ 65691 (CAS 744)  
**P:** SDNHM 39773 (3867, 3868), 2 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá, dredged in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.
- oerstedianum*, *Epitonium* (*Nitidiscala*) Hertlein & Strong, 1951, 36(2): 89, pl. 3, fig. 10  
**H:** CASIZ 65089  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía Santa Inez, off Punta San Domingo, Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m) on sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.  
**Comment:** As a synonym of *E. replicatum* (G. B. Sowerby I, 1844) (DuShane, 1974; Weil, Brown & Neville, 1999).
- osborni*, *Aesopus* Hertlein & Strong, 1951, 36(2): 83-84, pl. 11, fig. 2  
**H:** CASIZ 65020 [and one, no number given lot]  
**P:** CASIZ 64516, 5 spec., CASIZ 65023, 4 spec.  
**P:** SDNHM 12256 (1570-1574), 5 spec., donor: Leo G. Hertlein  
**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), dredged in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 December 1937.
- otniroensis*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 96, pl. 5, fig. 4  
**H:** CASIZ 63376  
**P:** CASIZ 64981, 2 spec.  
**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.  
**Comment:** Synonym of *Pyrgiscus collea* (Bartsch, 1926) (Odé, 1996).

- ottomoerchi*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 99, pl. 4, fig. 5  
**H:** CASIZ 64986  
**V:** CASIZ one voucher, no number given  
**P:** CASIZ 65051, 2 spec.  
**Type locality:** Corinto, Chinandega, Nicaragua, beach drift, 1937 or 1938.  
**Comment:** Synonym of *Pyrgiscus porteri* (Baker, Hanna & Strong, 1928) (Odé, 1996).
- ozanneana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 98, pl. 5, fig. 15  
**H:** CASIZ 64982  
**P:** CASIZ 64980, 1 spec.  
**Type locality:** Corinto, Chinandega, Nicaragua, beach drift, 1937 or 1938.  
**Comment:** Synonym of *Pyrgiscus domingana* (Hertlein & Strong, 1951) (Odé, 1996).
- palmeri*, *Triphora* Strong & Hertlein, 1939, 2(12): 209-210, pl. 20, fig. 1  
**H:** CASIZ 65695 (CAS 747)  
**P:** SDNHM 41019 (3721-3726), 6 spec., donor: Strong  
**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Allan Hancock Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.
- panamica*, *Pseudoneptunea* Hertlein & Strong, 1951, 36(2): 81, pl. 2, figs. 6, 10  
**H:** CASIZ 65077  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Hannibal Bank, Panamá (7°23'30"N, 82°03'00"W), in 35-40 fm (64-73 m), with rocks, mud, dead coral, sand, shells and algae. Leg. R/V *Zaca*, 21 Mar. 1938.  
**P:** CASIZ 65076, 1 spec.  
**Type locality:** Bahía Santa Inez, Golfo de California, México (27°04'00"N, 111°54'00"W), in 40 fm (73 m) in sand and weed. Leg. Templeton Crocker Expedition, 11 Apr. 1936.  
**Comment:** Placed in *Cantharus* Röding, 1798, "in the broad sense" in Keen, 1971, who stated that "*Pseudoneptunea* has been shown not to be appropriate for American species."
- paradisi*, *Epitonium* (*Sthenorytis*) Hertlein & Strong, 1951, 36(2): 90, pl. 3, fig. 7  
**H:** CASIZ 65092  
**P:** CASIZ 66836, 1 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Gorda Banks, Golfo de California, México (23°01'00"N, 109°27'30"W), dredged in 70-80 fm (128-146 m) in sand and calcareous algae. Leg. Templeton Crocker Expedition, 23 Apr. 1936.  
**P:** CASIZ 65014, 1 spec.  
**Type locality:** Arena Bank, Golfo de California, México (23°29'00"N, 109°24'00"W), dredged in 45 fm (82 m) in mud and *Arca* conglomerates. Leg. Templeton Crocker Expedition, 20 Apr. 1936.  
**Comment:** Synonym of *Sthenorytis diana* (Hinds, 1844) (DuShane, in Keen, 1971; DuShane, 1974; Weil et al., 1999).
- pazensis*, *Turbonilla* (*Pyrgolampros*) Baker, Hanna & Strong, 1928, 17(7): 214-215, pl. 11, fig. 8  
**H:** CASIZ 66074 (CAS 4011)  
**Type locality:** La Paz, Baja California Sur, México, near the main wharf in 3-4 fm. Leg. Fred Baker, 1921.  
**Comment:** Synonym of *Turbonilla* (*P.*) *newcombei* Dall & Bartsch, 1907 (Odé, 1996).
- pedersenii*, *Crockerella* Hertlein & Strong, 1951, 36(2): 78-79, pl. 1, fig. 15  
**H:** CASIZ 65504  
**Type locality:** Bahía Santa Inez, Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m) on sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.  
**Comment:** As a synonym of *Pyrgocythara danae* (Dall, 1919) (McLean, in Keen, 1971).
- pericuana*, *Turbonilla* (*Pyrgiscus*) Strong, 1949, 48(2): 82-83, pl. 11, fig. 4  
**H:** CASIZ 65452 (CAS 9484)  
**P:** CASIZ 65453 (CAS 9485, 9486), 2 spec.  
**V:** SDNHM 41215, 3 spec., type locality, donor: Strong  
**Type locality:** Bahía de Concepción, Golfo de California, México. Leg. Fred Baker, 1921.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- perrini*, *Cerithiopsis* Hertlein & Strong, 1951, 36(2): 106-107, pl. 7, fig. 5  
**H:** CASIZ 65130  
**P:** CASIZ 65131, 2 spec.  
**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m) in gravelly sand and crushed shell bottom. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.
- porteri*, *Cerithiopsis* (*Cerithiopsida*) Baker, Hanna & Strong, 1938, 23(15): 222-223, pl. 19, fig. 2  
**H:** CASIZ 65952 (CAS 5455)  
**Type locality:** "Gulf of California", México, Leg. George D. Porter.
- porteri*, *Odostomia* (*Miralda*) Baker, Hanna & Strong, 1928, 17(7): 236-237, pl. 12, fig. 8  
**H:** CASIZ 66092 (CAS 4047)  
**P:** SDNHM 49078, 1 spec.  
**Type locality:** Golfo de California, México. Leg. George D. Porter, donor: F. Baker Collection.  
**Comment:** *Miralda* A. Adams, 1864, raised to a genus (Vaught, 1989).
- porteri*, *Rissoina* Baker, Hanna & Strong, 1930, 19(4): 30, pl. 1, fig. 15  
**H:** CASIZ 66053 (CAS 4601)  
**P:** SDNHM 49083 (1908-1914), 7 spec., donor: Fred Baker  
**Type locality:** "Gulf of California," México. Leg. George D. Porter, 1921.  
**Comment:** Placed in the genus *Schwartziella* Nevill, 1881 (Ponder, 1985a).



*porteri*, *Turbonilla* (*Pyrgiscus*) Baker, Hanna & Strong, 1928, 17(7): 217-218, pl. 11, fig. 10

**H:** CASIZ 66076 (CAS 4013)

**Type locality:** Golfo de California, México. Leg. G.D. Porter.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*portoparkerensis*, *Turbonilla* (*Ptycheulimella*) Hertlein & Strong, 1951, 36(2): 92-93, pl. 6, fig. 10

**H:** CASIZ 64987

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** *Ptycheulimella* Sacco, 1892, raised to a genus (Odé, 1996).

*realejoensis*, *Turbonilla* (*Cingulina*) Hertlein & Strong, 1951, 36(2): 92, pl. 5, fig. 2

**H:** CASIZ 64984

**P:** CASIZ 65053, 2 spec.

**Type locality:** Corinto, Chinandega, Nicaragua, beach drift. Eastern Pacific *Zaca* Expedition, 1937-1938.

**Comment:** *Cingulina* A. Adams, 1860, raised to a genus and moved from *Turbonilla* (Abbott, 1974).

*rehderi*, *Anachis* Hertlein & Strong, 1951, 36(2): 83, pl. 2, fig. 14

**H:** CASIZ 64999

**P:** CASIZ 65000, 3 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Port Parker (Bahía Santa Elena), Costa Rica (10°55'45"N, 85°49'05"W), dredged in 12 fm (22 m) in shelly mud. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** In the genus *Cosmioconcha* Dall, 1913 (Keen, 1971).

*rema*, *Calliostoma* Strong, Hanna & Hertlein, 1933, 21(10): 121-122, pl. 5, figs. 3, 4

**H:** CASIZ 66011 (CAS 6045)

**P:** CASIZ 66012 (CAS 6046), 1 spec.

**V:** CASIZ two voucher lots, no numbers given

**Type locality:** E shore of Isla María Madre, Islas Tres Marías, off Nayarit, México, dredged 10-25 fm (18-46 m) off the penal settlement. Leg. G. D. Hanna & E.K. Jordan, 1925.

**Comment:** Figure legend in original description lists Isla María Madre in error as part of the Islas Revillagigedo.

*rhizophorae*, *Odostomia* (*Miralda*) Hertlein & Strong, 1951, 36(2): 105-106, pl. 7, fig. 1

**H:** CASIZ 65003

**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.

**Comment:** *Miralda* A. Adams, 1864, raised to a genus (Vaught, 1989).

*rhizophorae*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong,

1951, 36(2): 98, pl. 5, fig. 12

**H:** CASIZ 64989

**P:** CASIZ 65052, 1 spec.

**Type locality:** Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*richthofeni*, *Caecum* Strong & Hertlein, 1939, 2(12): 224-225, pl. 20, fig. 11

**H:** CASIZ 65658 (CAS 709)

**P:** SDNHM 40384 (3773-3780), 8 spec.

**Type locality:** Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 1 Feb. 1932.

**Comment:** As a synonym of *Caecum quadratum* Carpenter, 1857 (Lightfoot, 1993a).

*ritteri*, *Anachis* Hertlein & Strong, 1951, 36(2): 82-83, pl. 2, fig. 11

**H:** CASIZ 65001

**P:** CASIZ 64515, 3 spec.

**P:** CASIZ 65002, 4 spec.

**P:** SDNHM 12254 (1567-1569), 3 spec., 1d and donor: Strong

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07' 51"W), dredged in 7 fm (12.6 m) in gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** In the genus *Costoanachis* Sacco, 1890 (Radwin, 1974).

*roseola*, *Cymatosyrinx* Hertlein & Strong, 1955, 107(2): 221-222, pl. 2, fig. 27

**H:** CASIZ 32849 (CAS 9893)

**P:** CASIZ 32850 (CAS 9894), 1 spec.

**Type locality:** 15 mi. S of La Puerta Light, Chiapas, Golfo de Tehuantepec, México (15°40'00"N, 93°49'00"W), in 28 fm (51 m). Leg. H. W. Clark, Templeton Crocker Expedition, 12 July 1932.

**P:** AMNH 73438, 2 spec.

**Collecting data:** Cabo Pasado, Manabí, Ecuador (00°32'00"S, 80°31'00"W), dredged in 10 fm (18 m), sand and dead shell fragments, April 14, 1941.

**Comment:** In the genus *Drillia* Gray, 1838 (McLean, in Keen, 1971).

*rubilineata*, *Phasianella* (*Eulithidium*) Strong, 1928, 17(6): 197-198, pl. 10, figs. 8-10

**H:** CASIZ 64921 (CAS 2741)

**Type locality:** Pt. Loma, San Diego Co., California. Leg. Strong.

**P:** CASIZ 64922 (CAS 2742), 1 spec.

**Collecting data:** Bahía Todos Santos, Baja California Sur, México. Ex. Henry Hemphill Collection

**P:** CASIZ 64923 (CAS 2743), 1 spec.

**Collecting data:** Point Fermin, San Pedro, Los Angeles Co., California.



**Comment:** Synonym of *Tricolia variegata* (Carpenter, 1864) (Abbott, 1974). All eastern Pacific species now in the genus *Eulithidium* Pilsbry, 1898 (McLean, 1991, pers. comm., in Skoglund, 2002).

*salvadorica*, *Elaeocyma* Hertlein & Strong, 1951, 36(2): 76, pl. 11, fig. 5

**H:** CASIZ 65016

**V:** CASIZ one voucher lot, no number given

**Type locality:** La Libertad, El Salvador (13°27'20"N, 89°19'20"W), dredged in 13 fm (24 m), in mud. Leg. Eastern Pacific *Zaca* Expedition, 16 Dec. 1937.

**Comment:** In the genus *Drillia* Gray, 1838 (McLean, in Keen, 1971).

*sealei*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 201-202, pl. 19, fig. 6

**H:** CASIZ 65647 (CAS 757)

**P:** CASIZ 85645, 5 spec.

**P:** LACM 1344, 1 dry spec.

**V:** SDNHM 40523, 2 spec. from type locality, 1d and donor: Strong

**Type locality:** Bahía Honda, Isla Coiba, Veraguas, Panamá, dredged in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comments:** SDNHM data slip says "Ideotype." *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*sinaloa*, *Anachis* Strong & Hertlein, 1937, 22(6): 168, pl. 35, fig. 6.

**H:** CASIZ 65975 (CAS 6982)

**P:** CASIZ 85649, 20 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** 5 mi W of Mazatlán, Sinaloa, México (23°12'00"N, 106°29'00"W), dredged in 12 fm (22 m). Leg. Templeton Crocker Expedition, 2 August 1932.

**Comment:** In the genus *Parvanachis* Radwin, 1968 (Radwin, 1974).

*sinaloana*, *Turbonilla* (*Chemnitzia*) Strong, 1949, 48(2): 73-74, pl. 12, fig. 2

**H:** CASIZ 65454 (CAS 9467)

**Type locality:** Mazatlán, Sinaloa, México, beach. Expedition of the California Academy of Sciences to the Gulf of California. Leg. Leo G. Hertlein, 8 Dec. 1931.

*skogsbergi*, *Turbonilla* (*Pyrgolampros*) Strong, 1937, 51(2): 54-55, pl. 4, fig. 3

**H:** CASIZ 63871 (ex Stanford University, 6054)

**P:** SDNHM 40389 (669, 3319, 3384, 3385), 4 spec.

**P:** USNM 472882, 1 spec.

**Type locality:** Monterey Bay, 5 mi. N of Monterey, Monterey County, California, in 28 fm (51 m). Leg. Tage Skogsberg, 1935.

**Comment:** Synonym of *Turbonilla* (*P.*) *newcombei* Dall & Bartsch, 1907 (Odé, 1996).

*slevini*, *Diastoma* Strong, 1938, 23(14): 207, pl. 15, fig. 2

**H:** CASIZ 65892 (CAS 5809)

**V:** SDNHM 40757, 4 spec., from type locality, donor: Strong

**Type locality:** S end of Isla Guadalupe, off Baja California, México, dredged in 9-15 fm (16-27 m) from

a small patch of sandy bottom in a semi-sheltered cove, California Academy of Sciences Expedition. Leg. G D. Hanna & E.K. Jordan.

*slevini*, *Epitonium* (*Asperoscala*) Strong & Hertlein, 1939, 2(12): 193, pl. 18, fig. 9

**H:** CASIZ 65659 (CAS 724)

**P:** SDNHM 41096 (3686, 3687), 2 spec., donor: Strong  
**Type locality:** Off Isla Taboga, Panamá in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 1 Feb. 1932.

**Comment:** Synonym of *E. acapulcanum* Dall, 1917 (DuShane, in Keen, 1971; DuShane, 1974; Weil, Brown & Neville, 1999).

*socorroensis*, *Latirus* Hertlein & Strong, 1951, 50(2): 76-77, pl. 26, fig. 8

**H:** CASIZ 64949 (CAS 5896)

**P:** CASIZ 64945 (CAS 5897, 5897A, 5897B), 3 spec.

**Type locality:** Isla Socorro, Islas Revillagigedo, México. Leg. G D. Hanna & E.K. Jordan, 1925.

**P:** CASIZ 64522 (CAS 5898), 1 spec.

**P:** CASIZ 64946, 1 spec.

**V:** CASIZ 64939, one lot

**P:** SDNHM 12249 (1581a, b [1 shell & operculum]), donor: Leo G. Hertlein

**Type locality:** Isla Clarión, Islas Revillagigedo, México. Leg. G D. Hanna & E. K. Jordan, 1925.

**Comment:** Species was originally recorded by Strong & Hanna as *Latirus concentricus*.

*socorroensis*, *Liotia* Strong, 1934, 7(37): 439-440, pl. 31, figs. 4-6

**H:** CASIZ 66002 (CAS 5478)

**P:** SDNHM 41276 (3394-3396), 3 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Isla Socorro, Islas Revillagigedo, México, shore. Leg. G D. Hanna & E. K. Jordan, June 1925.

**Comment:** In the genus *Arene* H. Adams & A. Adams, 1854 (McLean in Keen, 1971).

*soniliana*, *Turbonilla* (*Pyrgolampros*) Hertlein & Strong, 1951, 36(2): 100, pl. 4, fig. 2

**H:** CASIZ 64985

**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), gravelly sand, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

*sorenseni*, *Odostomia* (*Chrysallida*) Strong, 1949, 48(2): 87, pl. 11, fig. 2.

**H:** CASIZ 65457 (CAS 9488)

**P:** CASIZ 65458 (CAS 9489, 9490), 2 spec.

**Type locality:** Mazatlán, Sinaloa, México, beach. Leg. Leo G. Hertlein, 8 Dec. 1931.

**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).

*sorenseni*, *Trophon* (*Acanthotrophon*) Hertlein & Strong, 1951, 36(2): 86-87, pl. 2, fig. 1

**H:** CASIZ 65098

**V:** CASIZ one voucher lot, no number given

**Type locality:** Gorda Banks, Golfo de California,

México (23°01'00"N, 109°29'00"W), dredged in 60 fm (109 m) in sand and calcareous algae. Leg. Templeton Crocker Expedition, 23 Apr. 1936.

**Comment:** *Acanthotrophon* Hertlein & Strong, 1951, raised to a genus (Radwin & D'Attilio, 1976).

*spiceri*, *Cyclostrema* Baker, Hanna & Strong, 1938, 23(25): 234-235, pl. 20, figs. 4-6

**H:** CASIZ 65945 (CAS 5462)

**Type locality:** Bahía Coyote, Bahía de Concepción, Golfo de California, México, ca 2 fm (4 m). Leg. Fred Baker, 1921.

**Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (DuShane in Keen, 1971).

*spiritualis*, *Delphinoidea* Baker, Hanna & Strong, 1938, 23(15): 238, pl. 21, figs. 1-3

**H:** CASIZ 65949 (CAS 5463)

**Type locality:** Isla Espíritu Santo, Golfo de California, México. Leg. Fred Baker, 1921.

**Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (Keen, 1971).

*stephensae*, *Delphinoidea* Baker, Hanna & Strong, 1938, 23(15): 238-239, pl. 21, figs. 4-6

**H:** CASIZ 65951 (CAS 5464)

**Type locality:** Isla María Madre, Islas Tres Marías, off west coast of México. Leg. G.D. Hanna & E.K. Jordan, June 1925.

**Comments:** Note on label states this is *Vitrinella stephensae* Baker, Hanna & Strong, according to Keen (1958-71) (pers. comm. G. Metz). In the "probable" genus *Bittium* Leach in Gray, 1847 (Ponder, 1983a).

*stephensae*, *Rissoina* Baker, Hanna & Strong, 1930, 19(4): 33-34, pl. 1, fig. 14

**H:** CASIZ 66056 (CAS 4607)

**P:** SDNHM 49093 (1916, 1917), 2 spec., donor: Fred Baker

**Type locality:** Cabo San Lucas, Baja California Sur, México. Leg. G.D. Hanna & E.K. Jordan, 1925.

**Comment:** Placed in the "probable" genus *Bittium* Leach in Gray, 1847 (Ponder, 1983b).

*stonei*, "*Philbertia*" Hertlein & Strong, 1939, 23(24): 375-376, pl. 32, fig. 8

**H:** CAS 4694, Geology/Fossil Type Collection

**Type locality:** Bahía James, Isla San Salvador, Islas Galapagos, Ecuador, on raised beach 15-20 ft (5-6 m) above base of cliffs on black lava flow. Pleistocene. Leg. Leo G. Hertlein, Allan Hancock Expedition of the California Academy of Sciences to the Galapagos Islands in 1931-1932.

**Comments:** Species in *Turbonilla* (*Pyrgiscus*) in Keen, 1971. Odé (1995) raised *Pyrgiscus* Philippi, 1841, to a genus.

*stonei*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1939, 2(12): 199-200, pl. 19, fig. 5

**H:** CASIZ 65645 (CAS 758)

**P:** CASIZ 85646, 16 spec.

**P:** LACM 1343, 1 dry spec.

**V:** SDNHM 41250, 6 spec. from type locality, donor:

Strong

**Type locality:** Bahía Honda, Isla Coiba, Veraguas, Panamá, dredged in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*strohbeeni*, *Cymatosyrinx* Hertlein & Strong, 1951: 77-78, pl. 1, fig. 14

**H:** CASIZ 065107

**P:** CASIZ 065103, 1 spec.

**P:** CASIZ 064506, 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Cabo San Lucas, Baja California Sur, México, dredged. Leg. Eastern Pacific Zaca Expedition, ?1938.

**Comments:** In the genus *Globidrillia* Woodring, 1928 (McLean in Keen, 1971). Label with holotype reads "coll. 'Zaca'?, 1938?". For CASIZ 065103, label states "Formerly SUPTC 8091 Templeton Crocker Exped. Stanford University" (pers. comm. G. Metz, 3/22/06).

*Strombinoturris* Hertlein & Strong, 1951, 36(2): 84-85 [new genus]

**Type species:** *Strombinoturris crockeri* Hertlein & Strong, 1951.

*subdotella*, *Odostomia* (*Telloda*) Hertlein & Strong, 1951, 36(2): 104, pl. 8, fig. 5

**H:** CASIZ 65005

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m), sandy mud, crushed shell. Leg. Eastern Pacific Zaca Expedition, 20 Jan. 1938.

**P:** CASIZ 65025, 3 spec.

**Collecting data:** Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific Zaca Expedition, 5 Jan 1938.

**Comment:** Synonym of *Eulimastoma dotella* (Dall & Bartsch, 1909) (Odé, 1994b).

*subgloriosa*, *Cerithiopsis* (*Cerithiopsis*) Baker, Hanna & Strong, 1938, 23(15): 218-219, pl. 18, fig. 7

**H:** CASIZ 65934 (CAS 5453)

**Type locality:** Isla San José, Bahía Amortajada, Golfo de California, México. Leg. Fred Baker, 1921.

**P:** SDNHM 40486 (1918), 1 spec., donor and 1d: Strong

**Type locality:** La Paz, Baja California Sur, México in ± 4 fm (7 m). Leg. George D. Porter.

*sulacana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 95, pl. 6, fig. 12

**H:** CASIZ 64988

**P:** CASIZ 64992, 3 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific Zaca Expedition, 20 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*supranodosa*, ?*Liotia acuticostata* Strong, 1934, 7(37): 438-439, pl. 30, figs. 4-6 [new subspecies]

**H:** CASIZ 66001 (CAS 5472)

**Type locality:** San Diego, San Diego County, California. Leg. Henry Hemphill.

**Comments:** The type specimen is one of a lot of four found in the Hemphill Collection at the California Academy of Sciences and marked: "Types." [See discussion p. 439 of original description.]

*swansonii*, *Pterynotous* (*Pteropurpura*) Hertlein & Strong, 1951, 36(2): 85, pl. 2, figs. 8, 12

**H:** CASIZ 65078

**V:** CASIZ one voucher lot, no number given

**Type locality:** Arena Bank, Golfo de California, México (23°28'30"N, 109°25'00"W), dredged in 45 fm (82 m) in mud. Leg. Templeton Crocker Expedition, 30 Apr. 1936.

**Comment:** Synonym of *Pteropurpura centrifuga* (Hinds, 1844) (Radwin & D'Atilio, 1976).

*swetti*, *Odostomia* (*Chrysallida*) Strong & Hertlein, 1939, 2(12): 206, pl. 18, fig. 11

**H:** CASIZ 65686 (CAS 738)

**Type locality:** Off Isla Taboga, Bahía de Panam, Panam, dredged in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition.

**P:** CASIZ 85638, 24 spec.

**P:** SDNHM 40571 (3705-3709), 5 spec., donor: Strong

**Type locality:** Bahía Honda, Veraguas, Panam, in channel between Islas Taboga and Urava in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 1 Feb. 1932.

**P:** LACM 1347, 2 dry spec.

**Type locality:** Isla Taboga, Bahía de Panam, Panam, in 3-9 fm (5-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition.

**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).

*taigai*, *Circulus* Hertlein & Strong, 1951, 36(2): 111, pl. 10, figs. 6, 8, 9

**H:** CASIZ 65124

**P:** CASIZ 65125, 3 spec.

**Type locality:** Corinto, Chinandega, Nicaragua, in beach drift, Eastern Pacific *Zaca* Expedition, 1937 or 1938.

**Comment:** In the genus *Cyclostremiscus* Pilsbry & Olsson, 1945 (DuShane in Keen, 1971).

*tangolaensis*, *Crassispira* Hertlein & Strong, 1951, 36(2): 75, pl. 1, fig. 13

**H:** CASIZ 65489

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Tangola-Tangola, Oaxaca, México (15°45'34"N, 96°06'02" to 96°06'02"W), dredged in 6-7 fm (11-13 m) in sand and crushed shell bottom. Leg. Eastern Pacific *Zaca* Expedition, 9 Dec. 1937.

**Comment:** Considered a synonym of *C. unicolor* (G. B. Sowerby I, 1834) (McLean, in Keen, 1971).

*teevani*, *Anachis* Hertlein & Strong, 1951, 36(2): 83, pl. 2, fig. 5

**H:** CASIZ 65021

**V:** CASIZ one voucher lot, no number given

**Type locality:** 17 mi. SE x E of Acapulco, Guerrero, México (16°38'30"N, 99°40'00"W), dredged in 28 fm (51 m). Leg. Eastern Pacific *Zaca* Expedition, 29 Nov. 1937.

**Comment:** In the genus *Costoanachis* Sacco, 1890 (Radwin, 1974).

*tehuantepecana*, *Odostomia* (*Evalina*) Hertlein & Strong, 1951: 36(2): 105, pl. 8, fig. 7

**H:** CASIZ 65032

**P:** CASIZ 65064, 1 spec.

**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (13 m), gravelly sand and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** *Evalina* A. Adams, 1860, raised to a genus (Odé, 1994a).

*tehuantepecana*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 99-100, pl. 5, fig. 7

**H:** CASIZ 64993

**P:** CASIZ 64979, 1 spec.

**Type locality:** Near Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), dredged in 7 fm (12.6 m) gravelly sand, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*Telloda* Hertlein & Strong, 1951: 36(2): 104 [new subgenus]

**Type species:** *Odostomia* (*Scalenostoma*) *dotella* Dall & Bartsch, 1909.

*templetonis*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 95, pl. 6, fig. 11

**H:** CASIZ 64991

**P:** CASIZ 64990, 2 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m) in sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*tinctum* var. *bormanni*, *Epitonium* (*Nitidoscala*) Strong, 1941: 46-47

**H:** LACM 1064

**P:** CASIZ 63870, 5 spec.

**P:** CASIZ 65696, 4 spec.

**P:** SDNHM 40871 (452, 1521-1527), 8 spec., donor: Strong

**P:** SBMNH 8119, 4 spec.

**P:** SBMNH 34861, 3 spec.

**Type locality:** Mission Beach, Mission Bay, San Diego Co., California, associated with sea anemones. Leg. Mr. & Mrs. Bormann, Oct. 1939.

**Comment:** Synonym of *E. tinctum* (Carpenter, 1865) (DuShane, 1979)



*togatum*, *Epitonium* (*Cirsotrema*) Hertlein & Strong, 1951, 36(2): 89, pl. 3, figs. 1, 5

**H:** CASIZ 65015

**V:** CASIZ one voucher lot, no number given

**Type locality:** Gorda Banks, Golfo de California, México (23°01'00"N, 109°27'30"W), dredged in 50 fm (91 m) in sand. Leg. Templeton Crocker Expedition, 3 May 1936.

**P:** CASIZ 65016, 1 spec.

**V:** CASIZ 64518, one voucher lot, no number given

**Collecting data:** 14 mi SE of Punta Judas, Puntarenas, Costa Rica (9°19'32"N, 84°29'30"W to 9°17'40"N, 84°17'30"W), in 42-61 fm (76.5-112 m) on mud, shell & rock bottom. Leg. Templeton Crocker Expedition, 1 Mar. 1936.

**Comment:** In the genus *Cirsotrema* Mörch, 1852 (DuShane, 1974).

*tolteca*, *Turbonilla* (*Pyrgiscus*) Baker, Hanna & Strong, 1928, 17(7): 220-221, pl. 11, fig. 13

**H:** CASIZ 66014 (CAS 4016)

**Type locality:** Golfo de California, México. Leg. George D. Porter.

**Comment:** Synonym of *Pyrgiscus lara* (Dall & Bartsch, 1909) (Odé, 1996).

*treva*, *Anachis* Baker, Hanna & Strong, 1938, 23(16): 251, pl. 24, fig. 4

**H:** CASIZ 65954 (CAS 5820)

**V:** CASIZ one voucher lot, no number given

**V:** SDNHM 40249, 6 spec., donor: Strong

**Type locality:** Isla María Madre, Islas Tres Marías, off Nayarit, México.

**Comment:** In the genus *Costoanachis* Sacco, 1890 (Radwin, 1974).

*trosti*, *Amphithalamus* Strong & Hertlein, 1939, 2(12): 228-229, pl. 21, fig. 2

**H:** CASIZ 65669 (CAS 706)

**P:** SDNHM 2358 (3789-3796), 8 spec., 1d and donor: Strong.

**Type locality:** Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.

**Comment:** As a synonym of *Amphithalamus inclusus* Carpenter, 1864 (Ponder, 1983b).

*turricula ballenaensis*, *Crassispira* Hertlein & Strong, 1951, 36(20): 73, pl. 11, figs. 4, 11

**H:** CASIZ 65490

**Type locality:** Puerto Culebra, Bahía de Culebra, Guanacaste, Costa Rica (10°37'03" to 10°36'22"N, 85°41'12" to 85°41'08"W) in 14 fm (26.5 m) in sandy mud. Leg. Eastern Pacific *Zaca* Expedition, 30 Jan. 1938.

**P:** CASIZ 65491, 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Bahía Ballena, Golfo de Nicoya, Costa Rica (9°44'52"N, 84°51'25"W) in 35 fm (63.7 m) in mud. Leg. Eastern Pacific *Zaca* Expedition, 25 Feb. 1938.

**P:** CASIZ 85636, 1 spec.

**Collecting data:** Bahía Tenacatita, Jalisco, México (19°14'30"N, 104°51'30"W) in 40 fm (73 m). Leg. Eastern Pacific *Zaca* Expedition, 21 Nov. 1937.

**Comments:** Original listing for paratype lot CASIZ 85636 lists 5 specimens. Current list states 1 spec. "Note on paratype 85636 '1 specimen: *C. ballenaensis* Hertlein and Strong according to Keen (1958-1971)'" (pers. comm. G. Metz, 2/08/06). No longer considered a subspecies of *C. turricula* (G. B. Sowerby I, 1834) (McLean, in Keen, 1971).

*turveri*, *Acmaea* Hertlein & Strong, 1951, 50(3): 152-154, pl. 51, figs. 1-3

**H:** CASIZ 64932 (CAS 9533)

**P:** CASIZ 64933 (CAS 9534, 9535, 9536, 9537), 4 spec.

**P:** SDNHM 50794 (1582-1584), 3 spec. donor: Mrs. Mary Bormann

**Type locality:** Punta Colorado (near Guaymas), Sonora, México. Leg. M/M Henry Turver, 10 Jan. 1942.

**Comment:** In the genus *Lottia* Sowerby, 1834 (Lindberg, 1986).

*turveri*, *Kylis* Hertlein & Strong, 1951, 36(2): 76, pl. 1, fig. 1

**H:** CASIZ 65070

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Santa Inez, Golfo de California, México (27°04'00"N, 111°55'00"W), dredged in 30-35 fm (54-64 m) in muddy sand and crushed shell. Leg. Templeton Crocker Expedition, 11 Apr. 1936.

**Comment:** Synonym of *Calliclava alemene* (Dall, 1910) (McLean, in Keen, 1971).

*ulloana*, *Odostomia* (*Ividella*) Strong, 194, 48(2): 88, pl. 11, fig. 1

**H:** CASIZ 65459 (9491)

**Type locality:** La Paz, Baja California Sur, México. Leg. Fred Baker, 1921.

**Comment:** *Ividella* Dall & Bartsch, 1909, raised to a genus (McLean, 1984).

*ulyssi*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 96, pl. 5, fig. 10

**H:** CASIZ 63369

**P:** CASIZ 63378, 2 spec.

**Type locality:** Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.

**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*utuana*, *Turbonilla* (*Pyrgisculus*) Hertlein & Strong, 1951, 36(2): 93, pl. 5, figs. 6, 8

**H:** CASIZ 63368

**P:** CASIZ 63379, 1 spec.

**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm (27 m) in sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** In the subgenus *Dunkeria* Carpenter, 1857 (Keen, 1971).



*veleronis*, *Alvania* Hertlein & Strong, 1939, 23(24): 373-374, pl. 32, fig. 18.

H: CASIZ 65870 (CAS 700)

Type locality: Off Isla Taboga, Bahía de Panamá, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein.

Comment: As a synonym of *Lirobarleeia granti* (Strong, 1938) (Ponder, 1983b).

*veleronis*, *Cyclostrema* Strong & Hertlein, 1947: 31 [new name for *Cyclostrema bartschi* Strong & Hertlein, 1939, *non* Mansfield, 1930]

H: CASIZ 65673 (CAS 715)

Comment: No type locality given in Strong & Hertlein, 1947. Since this is a replacement name, the type material for *C. veleronis* has no type status. See Coan & Petit, 2006 for discussion.

*veraguaensis*, *Alabina* Strong & Hertlein, 1939, 2(12): 218-219, pl. 19, fig. 15

H: CASIZ 65668 (CAS 699)

P: SDNHM 40488 (3731-3752), 22 spec., donor: Strong

Type locality: Bahía Honda, Veraguas, Panamá, in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, 22 Dec. 1931.

Comment: In the genus *Finella* A. Adams, 1869 (Abbott, 1974).

*vestae*, *Turbonilla* (*Bartschella*) Hertlein & Strong, 1951, 36(2): 91-92, pl. 6, fig. 4

H: CASIZ 63375

P: CASIZ 63370, 2 spec.

Type locality: Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.

*vivesi*, *Epitonium* (*Asperiscala*) Hertlein & Strong, 1951, 36(2): 88, pl. 3, fig. 11

H: CASIZ 65068

V: CASIZ one voucher lot, no number given

Type locality: Bahía Santa Inez, off Punta San Domingo, Golfo de California, México (26°52'00"N, 111°53'00"W) in 4-13 fm (7-24 m) in sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.

Comment: Synonym of *E. eutaenium* (Dall, 1917) (DuShane in Keen, 1971).

*vivesi*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 93, pl. 6, fig. 15

H: CASIZ 63366

P: CASIZ 63373, 2 spec.

Type locality: "Off San Domingo Point" Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m), sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.

Comment: *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*vizcainoana*, *Odostomia* (*Chrysallida*) Baker, Hanna & Strong, 1928, 17(7): 229-230, pl. 12, fig. 10

H: CASIZ 66086 (CAS 4034)

P: CASIZ 66087 (CAS 4035-4037), 3 spec.

Type locality: La Paz, Baja California Sur, México, off the main wharf in 4 fm (7 m). Leg. Fred Baker, 1921.

Comment: *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).

*walkerianum*, *Epitonium* (*Asperiscala*) Hertlein & Strong, 1951, 36(2): 88-89, pl. 3, fig. 12

H: CASIZ 65071

P: CASIZ 65069, 2 spec.

V: CASIZ one voucher lot, no number given

Type locality: Near Corinto, Chinandega, Nicaragua (12°28'03"N, 87°12'39"W), dredged in 12-13 fm (22-24 m) in mangrove leaves. Leg. Eastern Pacific *Zaca* Expedition, 5 Jan. 1938.

*wetmorei*, *Turbonilla* (*Pyrgiscus*) Strong & Hertlein, 1937, 22(6): 172, pl. 35, fig. 1

H: CASIZ 65982 (CAS 6991)

P: CASIZ 65983 (CAS 6992, 6993), 2 spec.

V: CASIZ 85651, number of specimens not given

Type locality: 5 mi W of Mazatlán, Sinaloa, México (23°12'00"N, 106°29'00"W), dredged in 12 fm (22 m). Leg. Templeton Crocker Expedition, 2 August 1932.

Comment: *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).

*willetti*, *Anticlimax* (*Subclimax*) Hertlein & Strong, 1951, 36(2): 112-113, pl. 9, figs. 13-15

H: CASIZ 65067

P: CASIZ 65065, 2 spec.

Type locality: Near Port Parker, Bahía Elena, Costa Rica (10°56'05"N, 85°29'45"W), in 15 fm (27 m), in sandy mud and crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 21 Jan. 1938.

P: CASIZ 65066, 1 spec.

Type locality: Same as above but (10°55'45"N, 85°49'40"W), in 12 fm (22 m) in shelly mud.

*willetti*, *Epitonium* (*Nitidiscala*) Strong & Hertlein, 1937, 22(6): 171, pl. 35, fig. 5

H: CASIZ 65980 (CAS 6987)

P: CASIZ 65981 (CAS 6988, 6989, 6990), 3 spec.

V: CASIZ one voucher lot, no number given

Type locality: 5 mi W of Mazatlán, Sinaloa, México (23°12'00"N, 106°29'00"W), dredged in 12 fm (22 m). Leg. Templeton Crocker Expedition, 2 August 1932.

*willetti*, *Rissoina* Strong, 1938, 23(14): 209-210, pl. 15, fig. 6

H: CASIZ 65896 (CAS 5829)

P: SDNHM 40325 (3541-3549), 9 spec., donor: Strong

Type locality: Off S end of Isla Guadalupe, off Baja California, México, in 9-15 fm (16-27 m) in sand. Leg. G D. Hanna, E. K. Jordan & J. R. Slevin.

*woodbridgei*, *Marginella* Hertlein & Strong, 1951, 50(2): 80, pl. 26, figs. 3, 4

H: CASIZ 64937 (CAS 7253)

P: CASIZ 64938 (CAS 7254), 1 spec.

V: CASIZ one voucher lot, no number given

Type locality: San José, Escuintla, Guatemala. Leg. Woodbridge Williams, Apr. 1937.

Comment: In the genus *Prunum* Herrmannsen, 1852 (Keen, 1971).

*woodbridgei*, *Odostomia* (*Chrysallida*) Hertlein & Strong, 1951, 36(2): 103, pl. 3, fig. 8.

- H:** CASIZ 64997  
**P:** CASIZ 65072, 1 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°56'05"N, 85°49'25"W), in 15 fm, sandy mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** *Chrysallida* Carpenter, 1857, raised to a genus (Fretter & Graham, 1986).
- wurtsbaughi*, *Epitonium* (*Nitidiscala*) Strong & Hertlein, 1939, 2(12): 193-194, pl. 18, fig. 14  
**H:** CASIZ 65660 (CAS 725)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía Honda, Veraguas, Panamá, dredged in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Expedition, 22 Dec. 1931.  
**Comment:** Synonym of *E. replicatum* (G. B. Sowerby 1, 1844) (DuShane, in Keen, 1971).
- xanti*, *Crassispira* Hertlein & Strong, 1951, 36(2): 74-75, pl. 1, fig. 3  
**H:** CASIZ 65063  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía San Lucas, Baja California Sur, México, in 2-20 fm (3.6-36 m). Leg. Templeton Crocker Expedition, Mar - May 1936.  
**P:** CASIZ 64994, 2 spec.  
**Collecting data:** Piedra Blanca, Costa Rica, at shore, Eastern Pacific *Zaca* Expedition, Feb. 1938.  
**Comment:** Label in vial says specimens were identified by Strong (pers. comm. G. Metz, 3/22/06).
- yolettae*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 94, pl. 6, fig. 13  
**H:** CASIZ 63383  
**Type locality:** Off Punta San Domingo, Bahía Santa Inez, Golfo de California, México (26°52'00"N, 111°53'00"W), in 4-13 fm (7-24 m) sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- zaca*, *Mitra* Strong, Hanna & Hertlein, 1933, 22(10): 120-121, pl. 5, fig. 10  
**H:** CASIZ 66009 (CAS 6061)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía Santa María, Baja California Sur, México, dredged in 10-16 fm (18-29 m). Leg. Templeton Crocker, Templeton Crocker Expedition, 11 August 1932.  
**Comment:** A slender northern form of *Mitra* (*Atrimitra*) *swainsonii* Broderip, 1836 (Keen, 1971).
- zaca*, *Fusinus* Strong & Hertlein, 1937, 22(6): 165-166, pl. 35, fig. 10  
**H:** CASIZ 65972 (CAS 6979)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** 10 mi E of San José del Cabo, Baja California Sur, México (23°03'00" to 23°06'00"N, 109°31'00" to 109°36'00"W), in 20-220 fm (37-403 m). Leg. Templeton Crocker Expedition, 4 August 1932.
- zaca*, *Kyllix* Hertlein & Strong, 1951, 36(2): 76, pl. 1, fig. 5

- H:** CASIZ 65073  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Bahía Santa Inez, off Punta San Domingo, Golfo de California, México (26°52'00"N, 111°53'00"W), dredged in 4-13 fm (7-24 m) in sand. Leg. Templeton Crocker Expedition, 16 Apr. 1936.
- zaca*, *Teinostoma* Hertlein & Strong, 1951, 36(2): 112, pl. 10, figs. 11-13  
**H:** CASIZ 64996  
**P:** CASIZ 64998, 2 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** Skoglund & Koch (1995) state they do not believe the species belongs in *Teinostoma*.
- zaca*, *Turbonilla* (*Pyrgiscus*) Hertlein & Strong, 1951, 36(2): 95, pl. 3, fig. 3  
**H:** CASIZ 63371  
**P:** CASIZ 63372, 2 spec.  
**Type locality:** Near Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in shelly mud. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.  
**Comment:** *Pyrgiscus* Philippi, 1841, raised to a genus (Odé, 1995).
- zeteki*, *Barleeia* Strong & Hertlein, 1939, 2(12): 228, pl. 21, fig. 1  
**H:** CASIZ 65670 (CAS 707)  
**P:** SDNHM 40730 (3797-3815), 19 spec., donor: Strong  
**Type locality:** Bahía Honda, Veraguas, Panamá in 3-9 fm (6-16 m). Leg. Leo G. Hertlein, Allan Hancock Pacific Expedition, 22 Dec. 1931.  
**Comment:** As a synonym of *B. paupercula* C.B. Adams, 1852 (Ponder, 1983b).
- zeteki*, *Muricopsis* Hertlein & Strong, 1951, 36(2): 85-86, pl. 2, fig. 9  
**H:** CASIZ 64995  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Panama City, Panamá. Leg. James Zetek.  
**Comments:** Although described as a new species, earlier names applicable to this species were junior homonyms [*Murex aculeatus* Wood, 1828 *non* Lamarck, 1822; *M. dubius* G.B. Sowerby 1, 1841, *non* Dillwyn, 1817]. It, thus, has its own type material and locality (Coan & Petit, 2006).

#### .Opisthobanchia

- liriope*, *Alys* (*Aliculastrum*) Hertlein & Strong, 1951, 36(2): 71, pl. 8, fig. 2  
**H:** CASIZ 65495  
**V:** CASIZ one voucher, no number given  
**Type locality:** Arena Bank, Golfo de California, México (23°28'N, 109°24'W), in 50 fm (91 m), sand, calcareous algae, rock. Leg. Templeton Crocker Expedition?, 1 May 1936?

Comment: Label reads "coll. 'Zaca' 1 May 1936 (?)" (pers. comm. G. Metz, 3/22/06).

*stephensae*, *Cylichna* Strong & Hertlein, 1939, 2(12): 190, pl. 18, figs. 2, 5

H: CASIZ 65662 (CAS 717)

P: LACM 1339, 1 dry spec.

Type locality: Isla Coiba, Bahía Honda, Veraguas, Panamá, in 3-9 fm (5-16 m). Allan Hancock Pacific Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.

*tabogaensis*, *Cylichna* (*Cylichnella*) Strong & Hertlein, 1939, 2(12): 191-192, pl. 18, fig. 4

H: CASIZ 65664 (CAS 718)

V: CASIZ one voucher, no number given

P: LACM 1341 (1 dry spec.)

P: SDNHM 41004a (3683-3685), 3 spec., donor: Strong  
Type locality: Off Isla Taboga, Veraguas, Panamá, dredged in 3-9 fm (5-16 m). Allan Hancock Pacific Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 1 Feb. 1932.

P: SDNHM 41004b, 4 spec., donor: Strong

Type locality: Bahía Honda, Veraguas, Panamá. Leg. Leo G. Hertlein, 1931.

Comment: Genus changed to *Acteocina* Gray, 1847 (Mikkelsen & Mikkelsen, 1984).

*veleronis*, *Cylichna* Strong & Hertlein, 1939, 2(12): 191, pl. 18, fig. 3

H: CASIZ 65663 (CAS 719)

V: CASIZ one voucher lot, no number given

P: LACM 1340 (1 dry spec.)

Type locality: Bahía Honda, Veraguas, Panamá, in 3-9 fm (5-16 m). Allan Hancock Pacific Expedition to the Galapagos Islands, 1931-1932. Leg. Leo G. Hertlein, 22 Dec. 1931.

### Scaphopoda

*cedrosense*, *Dentalium* (*Rhabdus*) Hertlein & Strong, 1951, 36(2): 69-70, pl. 11, fig. 9

H: CASIZ 65510

Type locality: 1 mi E of Isla Cedros, off Baja California, México (28°20'00"N, 115°10'30"W), in 45 fm (82 m), crushed shell, mud. Leg. Templeton Crocker Expedition, 22 May 1936.

Comment: Synonym of *Episiphon innumerabilis* (Pilsbry & Sharp, 1897) (Keen, 1971).

### Bivalvia

*aletes*, *Pitar* (*Hyphantosoma*) Hertlein & Strong, 1948, 33(4): 172-173, pl. 1, figs. 9, 11-13

H: CASIZ 65554 (both valves)

V: CASIZ one voucher lot, no number given

Type locality: Arena Bank, Golfo de California, México (23°29'00"N, 109°24'00"W), in 45 fm (82 m) mud and *Arca* conglomerate. Leg. Templeton Crocker Expedition, 20 Apr. 1936.

*arenica*, *Tellina* (*Moerella*) Hertlein & Strong, 1949, 34(2): 68-69, pl. 1, figs. 5, 11

H: CASIZ 31181(right valve)

Type locality: Arena Bank, Golfo de California, México (23°30'00"N, 109°26'00"W), dredged in 43 fm (79 m) in mud. Templeton Crocker Expedition, 30 Apr. 1936. Leg. W. Beebe et al.

P: CASIZ 31182, 1 spec.

Collecting data: Near Puntarenas, Costa Rica between point and Bat Island, dredged. Leg. Templeton Crocker Expedition, 1 July 1932.

Comment: Synonym of *Tellina* (*Angulus*) *carpenteri* Dall, 1900 (Coan, Valentich Scott & Bernard, 2000).

*clarionense*, *Cardium* (*Laevicardium*) Hertlein & Strong, 1947, 31(4): 144-145, pl. 1, fig. 5-7, 14

H: CASIZ 65551, right and left valve

P: CASIZ; 65552, one valve

V: CASIZ one voucher, no number given

Type locality: 3 mi. off Pyramid Rock, Isla Clarión, Islas Revillagigedo, México (18°19'00"N, 114°45'00"W), in 55 fm (100 m), rock and coral bottom. Leg. Templeton Crocker Expedition, 12 May 1936.

P: CASIZ 65552, one spec.

Collecting data: Bahía Santa Inez, Golfo de California, México (26°57'00"N, 111°56'00"W), in 35 fm (64 m) in mud and crushed shell. Leg. Templeton Crocker Expedition, 13 Apr. 1936.

P: CASIZ 64508, one valve

Collecting data: Bahía Santa Inez, Golfo de California, México, on beach. Leg. Templeton Crocker Expedition, 1936.

P: SDNHM 13042a (1547a,b), 1 spec. w/1 broken valve, donor: Strong

Collecting data: Cerralbo Channel, Golfo de California, México. Leg. Eastern Pacific *Zaca* Expedition.

P: SDNHM 13042b (1548, 1549), 2 valves

Type locality: S of Isla Clarión, Islas Revillagigedo, México. Leg. Eastern Pacific *Zaca* Expedition.

Comment: In the genus *Laevicardium* Swainson, 1840 (Keen, 1971).

*clarionensis*, *Ctena* Hertlein & Strong, 1946, 31(3): 118, pl. 1, figs. 11, 12, 14

H: CASIZ 64323 both valves

V: CASIZ one voucher lot, no number given

Type locality: Bahía Sulphur, Isla Clarión, Islas Revillagigedo, México. Leg. Templeton Crocker Expedition, 1936.

Comment: The species has a "broad distribution from the Golfo de California to Perú (pers. comm., E. Coan, 30 April 2006).

*craneana*, *Semele* Hertlein & Strong, 1949, 34(4): 240-242, 258, pl. 1, figs. 19, 22

H: CASIZ 64521 (CASGTC 9249) (left valve)

P: CASIZ 64497 (SUPTC 8056), 1 valve

P: CASIZ 64534 (CAS 17714), 1 spec.



**V:** CASIZ two voucher lots, no numbers given  
**P:** AMNH 160337  
**Type locality:** Arena Bank, Golfo de California, México (23°29'00"N, 109°23'30"W), in 50 fm (91 m), in mud, *Arca* conglomerate. Leg. Templeton Crocker Expedition, 1936.  
**Comment:** See Coan (1988) for discussion of this species and the genus *Semele*.  
*crockeri*, *Cardium (Papyridea)* Strong & Hertlein, 1937, 22(6): 161-162, pl. 34, figs. 1, 2, 7, 10  
**H:** CASIZ 65963 (CAS 6969)  
**Type locality:** 13 mi SE of Cabo Tosco, Isla Santa Margarita, Baja California Sur, México (24°14'00" to 24°18'00"N, 111°28'00" to 111°29'00"W), dredged. Leg. Templeton Crocker Expedition, 8 August 1932.  
**Comment:** In the genus *Papyridea* Swainson, 1840 (Keen, 1971).  
*crockeri*, *Solen* Hertlein & Strong, 1950, 35(4): 225-226, pl. 1, figs. 3, 5, 7  
**H:** CASIZ 39970  
**Type locality:** Monypenny Point, Golfo de Fonseca, Chinandega, Nicaragua (13°03'00"N, 87°30'00"W), dredged in 6 fm (11 m) mud. Leg. Eastern Pacific *Zaca* Expedition, 24 Dec. 1937.  
**P:** CASIZ 61533, 1 spec.  
**Type locality:** Same locality as above in 5-16 fm (9-27 m), in sand, mud, crushed shell, mangrove leaves.  
**P:** CASIZ 64509, 1 spec.  
**Type locality:** Isla Meanguera, Golfo de Fonseca, El Salvador (13°08'00"N, 87°43'00"W), in 16 fm (27 m), mud, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 23 Dec. 1937.  
**P:** SDNHM 12246 (1565a,b) (2 valves, [1 broken]), donor: Leo G. Hertlein  
**Type locality:** La Unión, Golfo de Fonseca, El Salvador. Leg. Templeton Crocker Expedition, 1936.  
*eburnea askoyana*, *Tellina (Eurytellina)* Hertlein & Strong, 1955, 107(2): 197, pl. 3, figs. 13-15, 20, 21, 23 [new subspecies]  
**H:** CASIZ 31183 (CAS 9246) (right valve)  
**P:** CASIZ 32842, 1 right valve  
**P:** CASIZ 32843, 3 valves [CAS 9896 (left valve), 9897 (left valve), 9898 (right valve)]  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** 7 mi. W of Champerico, Guatemala (14°13'00"N, 92°02'00"W), in 14 fm (25 m) mud. Leg. "Askoy" Expedition, 15 Dec. 1937.  
**P:** CASIZ 32842 [CAS 9895] (right valve)  
**Collecting data:** La Libertad, El Salvador (13°27'20"N, 89°19'20"W), in 13 fm (24 m). Leg. "Askoy" Expedition, 16 Dec. 1937.  
**P:** AMNH 73432 (both valves together)  
**Collecting data:** Bahía Piñas, Panamá, in 8-18 fm (14-33 m) in gray sandy mud bottom. Leg. "Askoy" Expedition, 24 Feb. 1941.  
**Comment:** Synonym of *Tellina (E.) eburnea* Hanley, 1844 (Reguero & García-Cubas, 1989).

*eiseni*, *Modiolus* Strong & Hertlein, 1937, 22(6):160-161, pl. 34, figs.11, 14-16  
**H:** CASIZ 65962 (CAS 6968)  
**Type locality:** 38 mi SE of Mazatlán, Sinaloa, México (22°44'00"N, 105°59'00"W), in 10-17 fm (18-31 m). Leg. Templeton Crocker Expedition, 29 July 1932.  
*fernandezensis*, *Arca (Arca)* Hertlein & Strong, 1943, 28(3): 154 [new name for *Arca angulata* King & Broderip, 1832, *non* "Meuschen, 1787"]  
**Type locality:** Dredged in 80 fm (146 m) off Cumberland Bay at Isla Juan Fernandez, Chile, attached to a branch of coral.  
**Comment:** The supposed senior homonym is an unavailable non-binomial work. "...replacement name was unnecessary and workers should return to the use of the King and Broderip name" (Coan & Petit, 2006).  
*fonsecana*, *Mactra (Micromactra)* Hertlein & Strong, 1950, 35(4): 232, pl. 2, figs. 16, 19, 20  
**H:** CASIZ 61534  
**P:** CASIZ 61535, 1 spec.  
**P:** CASIZ 64511, 1 spec.  
**P:** CASIZ 159007, 1 spec.  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Ptas. Potosí & Monypenny, Golfo de Fonseca, Chinandega, Nicaragua. Leg. Eastern Pacific *Zaca* Expedition, Dec. 1937.  
**Comment:** In the genus *Mactrotoma* Dall, 1894 (Coan & Scott, 1997). Synonym of *Mactrotoma isthmica* (Pilsbry & Lowe, 1932) (pers. comm., E. Coan, 30 April 2006).  
*frizzelli*, *Pitar (Lamelliconcha)* Hertlein & Strong, 1948, 33(4): 176, pl. 1, figs. 1, 5, 7; pl. 2, fig. 11  
**H:** CASIZ 65555 (both valves)  
**V:** CASIZ one voucher lot, no number given  
**Type locality:** Arena Bank, Golfo de California, México (23°28'30"N, 109°25'00"W), in 45 fm (82 m), mud. Leg. Templeton Crocker Expedition, 30 Apr. 1936.  
**P:** CASIZ 65556, 1 valve  
**Type locality:** Gorda Banks, Golfo de California, México (23°06'00"N, 109°25'00"W), in 50 fm (91 m), rock, crushed shell. Leg. Templeton Crocker Expedition, 22 Apr. 1932 - 3 May 1936.  
**P:** CASIZ 64491, 2 valves  
**Type locality:** Gorda Banks, Golfo de California, México (23°02'00"N, 109°31'00"W), in 60 fm (110 m), sand. Leg. Templeton Crocker Expedition, 21 Apr. 1936.  
**P:** SDNHM 12265 (1550, 1551), 2 valves  
**Type locality:** Arena Bank, Golfo de California, México. Templeton Crocker Expedition, Apr. 1936, donor: Leo G. Hertlein.  
*galapagana*, *Transemella* Hertlein & Strong, 1939, 23(24): 378, pl. 32, figs. 1-3, 6, 7  
**H:** CASIZ 65872 (CAS 6904)  
**P:** CASIZ 65873, 1 valve  
**P:** CASIZ 65874, 1 valve  
**P:** CASIZ 65875 (CAS 6905 [lv], 6906 [rv], 6907-6909),



2 spec. + 1 valve

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Conway, Isla Santa Cruz, Islas Galápagos, Ecuador, "on the beach in shallow water." Allan Hancock Expedition of the California Academy of Sciences to the Galapagos Islands in 1931-1932. Leg. Leo G. Hertlein, 12-13 Jan. 1932.

**Comment:** In the genus *Nutricula* F. R. Bernard, 1982. Probably a synonym of *Nutricula humilis* (Carpenter, 1857) (pers. comm., E. Coan, 30 April 2006).

*granti*, *Pseudochama* Strong, 1934, 47(4): 137, pl. 8, figs. 6, 7

**H:** CASIZ 66004 (CAS 5808)

**P:** CASIZ 66005 (CAS 5808a), 1 spec.

**V:** CASIZ two voucher lots, no numbers given

**Type locality:** Off S side of Santa Catalina Island, Channel Islands, California, in 15-30 fm (27-55 m).

**Comment:** See Hertz & Skoglund (1992) for a discussion of this species.

*guadalupensis*, *Glycymeris* Strong, 1938, 23(14): 213-214, pl. 16, figs. 1, 2

**H:** CASIZ 65902 (CAS 5822)

**P:** CASIZ 65903, 1 valve

**P:** CASIZ 65904 (CAS 5823), 1 valve

**P:** SDNHM 40371 (3552-3557, 6 small valves in separate capsules), donor: Strong

**Type locality:** Off S end of Isla Guadalupe, off Baja California, México, in 9-15 fm (16-27 m).

**Comment:** Synonym of *Glycymeris septentrionalis* (Middendorff, 1849) (Coan, Valentich Scott & Bernard, 2000).

*guanacastense*, *Cardium* (*Americardia*) Hertlein & Strong, 1947, 31(4): 140-141

**H:** CASIZ 65549

**P:** CAS 9198, left valve [see comment]

**Type locality:** Bahía Culebra, Guanacaste, Costa Rica, shore collected, Jan. 1938.

**Comment:** The authors stated that *Cardium planicostatum* G.B. Sowerby I was used earlier by Sedgwick & Murchison, 1829, and a new name was required, hence they proposed *C. guanacastense* as a new species. Coan (2002) showed that there was no homonymy. Hertlein and Strong described *guanacastense* as a new species, albeit because of a supposed homonymy; therefore, it has its own type material and locality (Coan & Petit, 2006). Because the original G.B. Sowerby I name was never a junior homonym, the correct name for this species is *Americardia planicostatum* (Coan, 2002).

*guatulcoensis*, *Chione* Hertlein & Strong, 1948, 33(4):182, pl. 1, figs. 2, 4, 6, 10; pl. 2, figs. 1, 8, 12, 13

**H:** CASIZ 65557 (both valves)

**P:** CASIZ 64492, 3 valves

**P:** CASIZ 65558, 1 spec.

**V:** CASIZ two voucher lots, no numbers given

**P:** SDNHM 12245 (1552, 1553, [both valves]). Id and donor: Leo G. Hertlein

**Type locality:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), gravelly sand, crushed shell. Leg. Eastern Pacific Zaca Expedition, 5 Dec. 1937.

*hemphilli*, *Lima* (*Limaria*) Hertlein & Strong, 1946

**H:** CASIZ 64337, both valves

**V:** CASIZ one voucher lot, no number given

**Type locality:** San Diego, San Diego County, California. Leg. Henry Hemphill.

**V:** SDNHM 41105, 2 spec.

**Collecting data:** San Pedro, California, Leg & donor: Strong.

**Comment:** *Limaria* Link, 1807, raised to a genus (H. Vokes, 1973).

*inezensis*, *Taras* (*Taras*) Hertlein & Strong, 1947, 31(4): 130, pl. 1, figs. 1, 4

**H:** CASIZ 65548 (right valve)

**V:** CASIZ one voucher lot, no number given

**Type locality:** Bahía Santa Inez, Golfo de California, México (26°54'20"N, 111°48'45"W), in 35 fm (64 m) in mud and crushed shell. Leg. Templeton Crocker Expedition, 17 Apr. 1936.

**Comment:** In the genus *Diplodonta* Bronn, 1831 (Keen, 1971).

*kroeyeri ulloana*, *Cyclinella* Hertlein & Strong, 1948 (new subspecies), 33(4): 179-180, pl. 2, figs. 5-7

**H:** CASIZ 65559 (left valve)

**P:** CASIZ 65560 (left valve),

**P:** CASIZ 65561, 1 left, 1 right valve

**V:** CASIZ three voucher lots, no numbers given

**Type locality:** Bahía Santa Inez, Golfo de California, México (26°55'00"N, 111°54'00"W), in 25 fm (46 m) sand. Leg. Templeton Crocker Expedition, 13 Apr. 1936.

**Comment:** Synonym of *Cyclinella subquadrata* (Hanley, 1845) (Gemmell, Hertz & Myers, 1980).

*lanieri*, *Cuspidaria* Strong & Hertlein, 1937, 22(6): 162-163, pl. 34, fig. 8

**H:** CASIZ 65967 (CAS 6973)

**P:** CASIZ 65968 (CAS 6974), 1 spec.

**V:** CASIZ one voucher lot, no number given

**Type locality:** About 10 mi E of San José del Cabo, Baja California Sur, México (23°03'00" to 23°06'00"N, 109°31'00" to 109°36'00"W), in 20-220 fm (37-399 m). Leg. Templeton Crocker Expedition, 4 August 1932.

**Comment:** In the genus *Cardiomya* A. Adams, 1864 (Keen, 1971).

*liana*, *Tellina* Hertlein & Strong, 1945 [new name for *Tellina panamensis* Li, 1930, non Philippi, 1848]

**Type locality:** Off Isla Meanguera, Golfo de Fonseca, El Salvador, in 16 fm (27 m)

**Comment:** This was a true replacement name, so Hertlein and Strong's new type material has no type status. Moreover, the replacement name was unnecessary because Li's species was originally spelled *T. panamanensis*. Both species are synonyms of *Tellina eburnea* Hanley, 1844 (Coan & Petit, 2006).

*lucasana*, *Nuculana* Strong & Hertlein, 1937, 22(6):160, pl. 34, figs. 9, 12, 13

**H:** CASIZ 65959 (CAS 6966)

**P:** CASIZ 65980 (CAS 6967), 1 spec.

**V:** CASIZ one voucher, no number given

**P:** SDNHM 50600 (677a,b, 3334a,b-3336a,b), 4 spec.

[a,b refers to valves], donor: Strong

**Type locality:** 10 mi. E of San José del Cabo, Baja California Sur, México (23°03'00" to 23°06'00"N and 109°33'00" to 109°31'00"W), in 20-220 fm (37-399 m). Leg. Templeton Crocker Expedition, 5 Aug. 1932.

**Comment:** As *Nuculana* (*Jupiteria*) *lobula* (Dall, 1908). Strong & Hertlein material was based on large specimens of what Dall described from a juvenile (pers. comm., E. Coan, 3 May 2006).

*lucasana*, *Petricola* (*Petricola*) Hertlein & Strong, 1948, 33(4): 194, pl. 2, figs. 4, 9

**H:** CASIZ 65562, paired valves

**V:** CASIZ three voucher lots, no numbers given

**Type locality:** Cabo San Lucas, Baja California Sur, México.

**Comment:** See Coan (1997) for a discussion of this species and the genus *Petricola*.

*marella*, *Nuculana* (*Costelloleda*) Hertlein, Hanna & Strong, 1940, in Hertlein & Strong, 1940, 25(4): 399-400, pl. 2, figs. 12, 13

**H:** CASIZ 65656, complete specimen

**V:** CASIZ one voucher, no number given

**Type locality:** "Without definite locality although it probably came from the Gulf of California ...", Templeton Crocker Expedition to the Gulf of California, 1936.

*mazatlanica*, *Arca* (*Anadara*) Hertlein & Strong, 1943, 28(3): 156-157, pl. 1, figs. 1, 4

**H:** CASIZ 64296, (both valves)

**P:** CASIZ 64297, 2 spec.

**V:** CASIZ one voucher, no number given

**P:** SDNHM 40075, (3321a,b,-3323a,b), 3 spec. [a,b refers to valves], donor: Strong

**Type locality:** 19 mi W of Mazatlán, Sinaloa, México (23°06'00"N, 106°47'00"W), dredged in 120 fm (218 m). Leg. Templeton Crocker Expedition, 27 Apr. 1936.

**P:** SDNHM 43459 (676a,b) (1 spec.) [a,b refers to valves], donor: CAS

**Collecting data:** Gorda Banks, off S end of Baja California Sur, México in 75 fm (137 m). Leg. Templeton Crocker Expedition.

**Comment:** In the genus *Anadara* Gray, 1847 (Keen, 1971). The locality of SDNHM 43459 is not mentioned in the original description.

*mexicanus*, *Pitar* (*Pitarella*) Hertlein & Strong, 1948, 33(4): 171-172, pl. 1, figs. 3, 8

**H:** CASIZ 65553 (CAS 9240) 1 pair of valves

**Type locality:** 4 mi, SSW of Pta. Maldonado [Maldonado], Guerrero, México (16°16'30"N, 98°37'00"W), in 26 fm (47 m) in mud Eastern Pacific Zaca Expedition, 30 November 1937.

**Comment:** This was described as a new species, the authors also stating that it is a new name for *Pitar lenis* Pilsbry & Lowe, *non* Conrad, 1848. This was, thus, a new species described because of a homonym, but not a replacement name per se (Coan & Petit, 2006), and their type material and locality has its own status.

*Neopleurodon* Hertlein & Strong, 1940, 25(4): 419-420

**Type species:** *Pleurodon subdolos* Strong & Hertlein, 1937.

**Comment:** Synonym of *Nucinella* Wood, 1851 (pers. comm., E. Coan, 3 May 2006).

*nicoyana*, *Tellina* (*Scissula*) Hertlein & Strong, 1949, 34(2): 85-86, pl. 1, figs. 23-26

**H:** CASIZ 31190, both valves

**P:** CASIZ 31191, 1 spec.

**P:** SDNHM 12264 (1564a,b), 1 dead spec. (two valves, one with drill hole), donor: Leo G. Hertlein

**Type locality:** Bahía Ballena, Golfo de Nicoya, Costa Rica, in 35 fm (64 m), mud. Leg. Templeton Crocker Eastern Pacific Expedition, 25 Feb.

**P:** CASIZ 64494, 2 valves

**Type locality:** "also dredged in the same vicinity..." (9°44'52" to 9°42'00"N, 84°51'25" to 84°56'00"W), in 35 fm (64 m) in mud. Leg. Eastern Pacific Zaca Expedition, 25 Feb. 1938.

**Comment:** Subgenus changed to *Hertellina* Olsson, 1961 (Bernard, 1983).

*Nioche* Hertlein & Strong, 1948, 33(4): 186-187 [new subgenus]

**Type species:** *Venus asperrina* G. B. Sowerby I, 1835

**Comment:** Synonym of *Leukoma* Römer, 1857 (pers. comm., E. Coan, 30 April 2006).

*Notochione* Hertlein & Strong, 1948, 33(4): 18 [new subgenus]

**Type species:** *Venus columbiensis* G. B. Sowerby I, 1835.

**Comment:** Synonym of *Leukoma* Römer, 1857 (pers. comm., E. Coan, 30 April 2006).

*panamensis spectri*, *Macoma* (*Psammacoma*) Hertlein & Strong, 1949 [new subspecies], 34(2): 91-92, pl. 1, figs. 9, 10, 16

**H:** CASIZ 31198 (left valve)

**P:** CASIZ 31199 (right valve)

**V:** CASIZ "voucher lots" no numbers given

**Type locality:** Bahía Santa Inez, Golfo de California, México (26°57'00"N, 111°56'00"W), dredged in 35 fm (64 m) mud, crushed shell. Leg. Templeton Crocker Expedition, 13 Apr. 1936.

**Comment:** Synonym of *Macoma* (*Psammacoma*) *hesperus* (Dall, 1908) (pers. comm., E. Coan, 30 April 2006).

*Paphonotia* Hertlein & Strong, 1948, 33(4): 192-193 [new subgenus]

**Type species:** *Petricola elliptica* G. B. Sowerby I, 1834.

**Comment:** Synonym of *Notopaphia* Oliver, 1923 (pers. comm., E. Coan, 30 April 2006).

*Phyllodella* Hertlein & Strong, 1949, 34(2): 87 [new subgenus]

**Type species:** *Tellina* (*Phyllodella*) *insculpta* Hanley, 1844.

*plumula kelseyi*, *Lithophaga* Hertlein & Strong, 1946 [new subspecies], 31(2): 75, pl. 1, figs. 8, 9

**H:** CASIZ 32071

**Type locality:** San Diego, San Diego County, California. Leg. Henry Hemphill.

**Comment:** Synonym of *Lithophaga plumula* (Hanley, 1843) (Keen & Coan, 1975; Coan & Valentich Scott & Bernard, 2000).

*Politoleda* Hertlein & Strong, 1940, 25(4):397 [new subgenus]

**Type species:** *Nucula polita* (G. B. Sowerby I, 1833).

**Comment:** A subgenus of *Nuculana* (pers. comm., E. Coan, May, 2006).

*proclivis*, *Tellina* (*Merisca*) Hertlein & Strong, 1949, 34(2): 83-84, pl. 1, figs. 6, 7, 14

**H:** CASIZ 31194 (CAS 9226)

**P:** CASIZ not located [see comments]

**Type locality:** Holotype: Bahía Magdalena, Baja California Sur, México. Leg. Charles R. Orcutt, det. Leo G. Hertlein. Paratype: Bahía Tangola-Tangola, dredged in 23 fm (42 m) mud.

**Comment:** This was described as a new species, but created because of a homonymy – *Tellina declivis* G.B. Sowerby I, 1868, *non* *T. declivis* Conrad, 1834. It is, thus, a new species, with its own type material and locality. It was later shown that *T. declivis* Sowerby was a *Macoma* from some other province, and Hertlein (1968) became convinced that *T. proclivis* should be interpreted as a replacement name rather than a new species, so he unnecessarily renamed the eastern Pacific taxon, *Tellina ulloana* based on the same material from Bahía Magdalena (Coan & Petit, 2006).

Finally, work in progress is demonstrating that eastern Pacific material is indistinguishable from the western Atlantic *T. martinicensis* d'Orbigny, 1853 (Coan & Valentich-Scott, in preparation). If so, both *T. declivis* and *T. ulloana* would be synonyms of *T. martinicensis*. In any event, the unlocalized *T. declivis* Sowerby, a *Macoma*, has never been legitimately renamed (pers. comm., E. Coan 10 Oct. 2006). CASIZ holotype is for *T. ulloana* (Van Syoc, pers comm., 17 October, 2006).

The paratype cited in the original description from Bahía Tangola-Tangola, México, has not been located.

*recurvata*, *Tellina* (*Moerella*) Hertlein & Strong, 1949, 34(2): 71-72, pl. 1, figs. 2-4, 8.

**H:** CASIZ 31195 1 valve

**P:** CASIZ 31197 (CAS 9230, 9231), 2 valves

**Type locality:** Bahía San Luis Gonzaga, Golfo de California, México, in 24 fm (44 m) in mud. Leg. Fred Baker, 1921.

**P:** CASIZ 31196 (CAS 9228), 1 valve

**Collecting data:** Puerto Guatulco, Oaxaca, (15°44'N, 96°7'W), in 23 fm (42 m) in mud. Leg. W. Beebe et al., 7 Dec. 1937.

**Comments:** Hertlein and Strong stated that *T. recurva* Dall, 1900, *non* Deshayes, 1855, is a synonym. The Hertlein and Strong species, thus, has its own type material and locality (Coan & Petit, 2006). However, it is now considered to be a synonym of *Tellina* (*Moerella*) *tabogensis* Salisbury 1934 (Coan & Valentich-Scott, in preparation).

*saavedrai*, *Pseudochama* Hertlein & Strong, 1946, 31(3): 110-111, pl. 1, figs. 1, 3, 8, 10

**H:** CASIZ 64322 (both valves)

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off Manzanillo, Colima, México (19°03'45"N, 104°20'45"W), in 25 fm (40 m). Leg. Eastern Pacific *Zaca* Expedition, 22 Nov. 1937.

*salvadorica*, *Volsella* Hertlein & Strong, 1946, 31(2): 73, pl. 1, figs. 7, 11

**H:** CASIZ 64332 [left valve]

**V:** CASIZ one voucher lot, no number given

**Type locality:** Off La Libertad, El Salvador (13°27'20"N, 89°19'20"W), in 14 fm (25 m) in mud. Leg. Eastern Pacific Expedition, 16 Dec. 1937.

**Comment:** In the genus *Lioberus* Dall, 1898 (Keen, 1971).

*schencki*, *Nucula* (*Nuculopsis*) Hertlein & Strong, 1940, 25(4): 384, pl. 1, figs. 8-10

**H:** CASIZ 655653, both valves

**P:** CASIZ 65654, right valve,

**P:** CASIZ 65655, one valve

**V:** CASIZ two voucher lots, no numbers given

**Type locality:** Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), gray sand, crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

**Comment:** As *Nucula* (*Lamellinucula*) *schencki* Hertlein & Strong, 1940 (pers comm., E. Coan, 3 May 2006).

*subdolos*, *Pleurodon* Strong & Hertlein, 1937, 22(6):162, pl. 35, figs. 14, 18, 19

**H:** CASIZ 65964 (CAS 6970)

**P:** CASIZ 65965, 1 left valve

**P:** CASIZ 65966 (CAS 6971, 6972), 1 right valve

**V:** CASIZ three voucher lots, no numbers given

**Type locality:** 5 mi W of Mazatlán, Sinaloa, México (23°12'00"N, 106°29'00"W), in 21 fm (38 m). Leg. Templeton Crocker Expedition, 2 August 1932.

**Comments:** "Known only from the type locality [p.54]." As *Nucinella subdola* (Abbott, 1974).

*teevani*, *Periploma* Hertlein & Strong, 1946, 31(3): 95, pl. 1, figs. 2, 6

**H:** CASIZ 64324, both valves

**Type locality:** Bahía Tangola-Tangola, Oaxaca, Golfo de Tehuantepec, México (15°44'00"N, 96°05'00"W), in 30 fm (55 m) mud. Leg. Eastern Pacific *Zaca* Expedition, 13 Dec. 1937.

*Tellinidella* Hertlein & Strong, 1949, 34(2): 79-80 [new subgenus]

**Type species:** *Tellinides purpureus* Broderip & G. B. Sowerby I, 1829.

*texta*, *Atrina* Hertlein, Hanna & Strong, in Hertlein & Strong, 1943, 28(3): 166, pl. 1, figs. 9, 10

**H:** CASIZ 64321

**V:** CASIZ 64321

**Type locality:** Gorda Bank area, Baja California Sur, México (23°01'00"N, 109°30'00"W), in 70 fm (128 m). Leg. Templeton Crocker Expedition, 21 Apr. 1936.

**Comment:** As *Atrina* (*Servatrina*) *texta* (Coan, Valentich Scott & Bernard, 2000).



*tropicalis*, *Ensis* Hertlein & Strong, 1955, 107(2): 203, pl. 3, figs. 34, 35

H: AMNH 73421 (left valve)

P: AMNH 73422 (2 left valves, 2 right valves)

P: CASIZ 32846 (CAS 9901 [right valve], 9900 [left valve], 9902 [left valve] 9903 [right valve]), 4 spec.

P: SDNHM 41532 (1585-1588), 4 valves. Id and donor: Strong

**Type locality:** South Passage, Islas las Perlas, Panamá, in 15 fm (27 m), sandy bottom. Leg. "Askoy" Expedition of American Museum of Natural History, 13 Feb., 1941.

*trosti*, *Poromya* Strong & Hertlein, 1937, 22(6): 163-164, pl. 34, figs. 3-6

H: CASIZ 65969 (CAS 6975)

P: CASIZ 65970 (CAS 6976) (both valves)

**Type locality:** Cortes Bank, California, ca. 40 mi SW of San Clemente Island, Channel Islands, California, in 40-60 fm (73-110 m). Leg. Templeton Crocker Expedition, 24 August 1932.

**Comment:** Synonym of *Dermatomya buttoni* Dall, 1916 (Coan, Valentich Scott & Bernard, 2000).

*undatoides*, *Lucina* Hertlein & Strong, 1945 [new name for *Lucina undata* Carpenter, 1865, non Lamarck, 1819]

**Type locality:** Isthmus Cove, Isla Espíritu Santo, Golfo de California, México.

**Comment:** This was a true replacement name, so Hertlein and Strong's simultaneous designation of new type material and locality does not stand and their type material does not have type status (Coan & Petit, 2006). Moreover, it was never really a homonym, and return to the name *undata* will be recommended (Coan & Valentich-Scott, in preparation).

*velero biolleyi*, *Pecten* (*Leptopecten*) Hertlein & Strong, 1946, 31(2): 60, pl. 1, fig. 6 [new subspecies]

H: CASIZ 64334, right valve

P: CASIZ 64335, 3 valves

V: CASIZ two voucher lots, no numbers given

**Type locality:** Port Parker, Bahía Santa Elena, Puntarenas, Costa Rica (10°55'45"N, 85°49'05"W), in 12 fm (22 m) in sandy mud, crushed shells. Leg. Eastern Pacific *Zaca* Expedition, 20 Jan. 1938.

**Comment:** As *Leptopecten biolleyi* (Hertlein & Strong, 1946) (Keen, 1971).

*zaca*, *Tellina* (*Tellinella*) Hertlein & Strong, 1949, 34(2): 65-66, pl. 1, figs. 12, 13, 17

H: CASIZ 31200

**Type locality:** Arena Bank, Golfo de California, México (23°29'00"N, 109°25'00"W), in 35 fm (64 m) in sand. Leg. Templeton Crocker Expedition, 2 Apr. 1936.

P: CASIZ 64495, 2 valves

**Type locality:** "In same general region" (23°24'30" to 23°28'00"N, 109°23'30" to 109°24'W), in 35-42 fm (64-77 m), in sand, calcareous algae, weeds, Leg. Templeton

Crocker Expedition, 1-2 May 1936.

*zeteki*, *Septifer* Hertlein & Strong, 1946, 31(2): 71-72, pl. 1, figs. 1, 2

H: CASIZ 64328, both valves

P: CASIZ 64331, 1 spec.

**Type locality:** Off Isla Taboga, Veraguas, Panamá, dredged in 25 fm (46 m). Leg. James Zetek, 1937.

P: CASIZ 64329, 2 valves

P: CASIZ 64330, 1 right valve

V: CASIZ one voucher lot, no number given

**Collecting data:** Off Puerto Guatulco, Oaxaca, México (15°44'28"N, 96°07'51"W), in 7 fm (12.6 m), "green sand," crushed shell. Leg. Eastern Pacific *Zaca* Expedition, 5 Dec. 1937.

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## IN MEMORIAM

EDWARD BOYD

OCTOBER 1921 - SEPTEMBER 2006

It is with sadness that we report the passing of Ed Boyd, longtime member of the San Diego Shell Club and aficionado of Panamic shells. He and his late wife Pat would often be found with a group of like-minded Club collectors at a campsite in the Gulf of California.

Ed very generously donated his beautiful handmade boxes for shells at every Club auction and they were avidly bid upon.

Ed is survived by his four daughters and eight grandchildren.

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